Utah Black Bear Management Plan

June 27, 2000

Prepared by:

Black Bear Discussion Group

Utah Division of Wildlife Resources
1594 West North Temple
Salt Lake City, Utah 84114

John Kimball
Director

Publication No. 00-23

Utah Black Bear Management Plan

June 27, 2000

Prepared By:

Black Bear Discussion Group:

Jerry Mason, Utah Wildlife Federation, Chairman
Byron Bateman, Utah Big Game Hound Association
John Bair, Utah Bowman's Association
Don Peay, Sportsmen For Fish and Wildlife
Allison Jones, Wild Utah Project
Kirk Robinson, Predator Education Fund
Hal Black, Brigham Young University
Ken Moon, Utah Farm Bureau
Mike Bodenchuk, Wildlife Services
Rick Danvir, Utah Wildlife Board
Colleen Pelles Madrid, United States Forest Service
Bill Bates, Utah Division of Wildlife Resources

TABLE OF CONTENTS

TABLE OF CONTENTS (cont.)

LIST OF TABLES

LIST OF FIGURES

INTRODUCTION — Bill Bates

The black bear (*Ursus americanus*) has been a protected species in Utah since 1967, when a group of sportsmen petitioned the Utah State Legislature to protect both cougar (*Puma concolor*) and bear. Management methods have evolved since then, from unlimited permits with a spring and fall season from 1967 to 1989, to a limited entry spring and fall hunt from 1990 to 1992, and a limited entry fall only hunt from 1993 to the present. Animal protection groups were instrumental in eliminating the spring bear hunt in 1993.

Since elimination of the spring bear hunt several trends have been observed in black bear harvest: 1) an increase in the percent of females in the harvest; and 2) an increase in the number of black bears taken due to livestock depredation before the fall hunt starts.

In 1999, the director appointed an ad hoc committee, which became known as the Black Bear Discussion Group, to address these and other concerns with black bear management. This group contains citizen representatives of sportsmen and animal protection groups, researchers, livestock operators, and representatives from Federal and State agencies. The purpose of this document is to provide an assessment of black bear management, and provide direction for black bear management in Utah.

NATURAL HISTORY — Jerry Mason, Bill Bates

The range of the American black bear historically included all the forested areas of the continent from Alaska to the northern states of Mexico and from California, east to Florida and the Canadian provinces of Newfoundland and Nova Scotia. Today, while reduced, the range of black bear still includes all or parts of 38 states, 11 Canadian provinces, and 7 Mexican states. In Utah, the black bear is present in much of the forested habitat. The Deep Creek Mountains, Pilot Range, Henry Mountains, and Raft River Mountains are notable exceptions. There are an estimated 8.7 million acres (Blackwell,1995) of black bear habitat in Utah, mostly National Forest, but with significant parcels of private, BLM, State, and Native American land (Appendix I).

The black bear is secretive, long lived, and has a low annual reproduction rate compared to large North American wildlife species. Based on harvest levels, Utah may have the smallest bear population of all the western states, except Nevada. Data from the past thirty years suggests a fairly stable population but depredation harvest has increased in central Utah in recent years.

Description

In the mountain west most black bears have brown to dark chocolate pelage while a few are black. In the East they are generally black except for the frequent presence of a

white triangle on the upper chest, and brown muzzles. Bears from the west tend to have lighter muzzles, and some individuals are blonde. In Utah, the white chest patch is infrequent. The dark brown pelage may appear black, especially in low light conditions.

The weight of black bears varies. A male black bear that weighed 816 pounds was recorded in Minnesota in 1991. A female in Pennsylvania weighed 454 pounds (Rogers 1992). However, the mature western black bear male will typically be 250 - 300 pounds and the female 150-180 pounds in mid summer. These weights vary depending on season, age, and food supply. An Idaho study (Beecham and Rohlman 1994) showed a weight difference between male and female bears of all ages of 77 pounds (n=132). A Colorado study (Beck 1991) of a limited number of bears showed mean summer weights of 280 pounds for males and 167 pounds for females. In Utah, large males in summer may weigh over 300 pounds and adult females 130 to 150 pounds.

Black bears have a compact body with stout legs, especially the forearms, and feet. They have recurved claws, a straight facial profile and no shoulder hump. Mature males are about 60" long while mature females are about 50". After about 7 years, growth slows. The length measurements from the Colorado study showed greater lengths than Idaho in both males and females. Some differences in measurement techniques could account for part of the difference but the heavier weights from Colorado suggest that the Colorado bears may genetically be slightly larger or have access to better food supplies. Weights and lengths from ongoing studies in Utah are comparable to Colorado. Black bears have a keen sense of smell and stand on their hind legs to aid in seeing and smelling. They are strong swimmers.

In the west, black bears of both sexes occasionally live in excess of 20 years of age. Study animals, as well as harvested ones, have exceeded 20 years in Utah. In hunted Idaho populations the males averaged several years younger than the females (Beecham and Rohlman 1994). Hunter selectivity for larger bears coupled with the male bears larger range make them more likely to be taken.

Reproductive Biology

Black bears tend to be solitary, except for females with cubs, and during the breeding season of June and July. After fertilization the egg remains free and unattached in the uterus until implantation in late fall. Birth occurrs in late January or early February. The cubs are born with eyes closed and weigh 8 to 12 ounces. In the Intermountain west, age at first reproduction is typically 4.5 years. Males are sexually mature at 3.5 to 4.5 but don’t reach physical maturity until age 7.5. Occasionally, first litters occur at 3.5 or as late as 7.5 years. Litter sizes may increase with the age of the female but two cubs are most common. Poor food crops may result in females skipping a year or more between cub production. While the average is 2 cubs per litter, litter sizes range from 1 to 4. Typically, litters are produced every other year (Beck 1991). The sex ratio of cubs is either 1:1 or slightly male biased. Cub mortality is higher in the west with Utah fitting

the pattern at 45 to 50%. (Beecham and Rohlman 1994; Tolman and Black 1998). The average annual litter frequency (number of litters for all females in a population) for a typical western population is 16 to 18% (Beecham and Rohlman 1994) and may vary significantly year to year. Cubs stay with the females for 16 to18 months after birth. Family groups break up in late spring prior to the breeding season. Causes of cub mortality are starvation, predation, and a variety of other causes of unknown significance. Yearlings and subadults have a survival rate as high as 90% depending largely on the level of human caused mortality, primarily hunting, and removal for depredation and nuisance activity.

Predation

As omnivores, black bears use a wide variety of foods, changing diets seasonally based on availability (Beck 1991, Kolenosky and Strathearn 1987) and typically do not obtain much of their food through predation. Rogers (1987) found that fruits, nuts, and insects were the foods most important to fall fattening and reproductive success. A study in Idaho (Beecham and Rohlman 1994) revealed that typically less than 2% of the diet is mammals. Black bear research in Utah (Richardson 1991, Bates 1991, Bunnell 1999) has found that vegetative matter is the most important item in their diet, followed by mast, insects and animal matter. Ogborn (1990) documented the importance of ants in the diet.

In the LaSal Mountains, Richardson (1991) found that animal matter was present in 2.3% of 859 bear scats. It was most important as a food item in summer and fall. Mule deer (*Odocelius hemionus*) remains were the most common mammal, occurring in 9 scats, or 1.1% of all scats. Other mammal remains included black bear (mostly from grooming), domestic cattle, rock squirrel, *Microtus sp.*, cottontail rabbits, deer mouse, least chipmunk, jumping mouse, domestic sheep, and pocket gopher. Bone size and teeth of deer remains indicated that both adults and fawns were eaten. The presence of maggots in the scats indicated that cattle could have been fed upon as carrion. Bird remains were found in 2.1% of the scats analyzed. Claw marks on two nest trees indicated that bears unsuccessfully attempted to enter active goshawk nests in central Utah (Rod Player 1999, personal communication).

LeCount (1986) reported that there are three different ways that black bears obtain animals matter as food: 1) predation, where the bear kills a healthy animal; 2) pseudo-predation, where a bear kills an animal that is sick or otherwise stressed and would have died anyway; and 3) scavenging, where death comes from other causes.

Black bear predation on young deer, moose (*Alecs alecs*), caribou (*Rangifer tarandus*), and elk (*Cervus elaphus*) has been reported in several studies (Kolenosky and Strathearn 1987, Franzmann et al. 1980). Smith (1983) radio-collared 54 newborn mule deer fawns on the LaSal Mountains. He found that fawn survival was 54% during the first month of life. Of the 22 fawns that died, predation was the cause of death for 16 (73%). Coyote (*Canis latrans*) and black bear predation accounted for most of these

deaths, although he did not indicate how many were taken by which species. One was taken by a cougar (*Puma concolor*). With a peak fawning date of 24 June, all bear predation had ceased by 24 July. Coyote predation continued past 18 August. While most black bear predation consists of newborn animals their first month of life, Bates (1991), Richardson (1991), and Bunnell (1999) reported limited black bear predation on adult deer in Utah.

At times, black bears are effective predators on domestic livestock. In Utah, from 1992 to 1999, an average of 373 livestock kills by bears were confirmed annually. Almost 98% of all livestock kills were domestic sheep. Bears typically attack sheep herds after dark when sheep are bedded for the night. The majority of sheep predation occurs in June, July and August. Lambs accounted for 58%, and ewes 39% of black bear kills, respectively. The average number of livestock taken in a single predation incident was 6. In an apparent rare event in eastern Utah, a nine year old adult female bear killed three 150-200 lb. calves over a nine day period. This radio-collared female had not exhibited this pattern of behavior in the five previous years when her behavior was monitored (Bunnell 1999).

While black bears on occasion act as predators, they are also preyed upon. Rogers (1987) reported that nine wolves killed a mother bear and her cub in a den. Cub mortality due to predation was less than 12% in years of good nutrition. Richardson (1991) found two cases of black bear cannibalism in southeastern Utah. A radio-collared two-year old female was eaten by another bear, while another yearling female was apparently eaten by her mother while in the den.

Most researchers indicate that black bears are poor predators. As omnivores, they have not evolved behaviors found in cooperative hunters (Rogers 1987). Their bulky, heavy bodies lack the agility needed for effective predation. Legs are adapted for climbing, turning rocks and tearing apart logs and stumps, rather than speed. Most mammals, both large and small, are generally too fast for bears to catch (Kolenosky and Strathearn 1987). A bear's distance vision is poorly developed. These limitations prevent black bears from taking most prey, other than newborns or other animals whose escape is hampered by behavior, injuries, disease or deep snow.

Denning

Denning and hibernation in black bears is an evolved means of dealing safely with a winter food shortage. It also offers a protected situation for females to give birth to and raise young cubs. The choice of den location, size, and type are affected by topography and ease of construction. Concealment appears to be a higher priority than avoiding thermal loss. Where large trees are available they are generally selected, and the dens are dug into the tree or in the root system. The other options are ground dens which are excavated into a brushy hillside, or dens in rocky areas where rock provides a part of the den structure. In Utah, dens are predominately rock related (Tohlman and Black 1998). Females select sites that are at a slightly higher elevation than males in a given

area. Few dens are reused from year to year but a yearling female may use a den previously used by her mother. Availability of acceptable den sites is not likely to limit bear densities.

Beck (1991) noted that at least some bears made periodic movements to den-sites in the summer to prepare them with a lining of green vegetation. He also suggested that the primary function of the den is to provide protection from predators rather than weather. Both wolves (Pacquet and Carbyn 1986) and grizzly bears (Ross et al. 1988) have been observed killing black bears in winter dens.

Females tend to enter dens earlier, and exit dens later than males (Beecham et al. 1983, Beck 1991). The onset of denning may be delayed by two to three weeks if plentiful food is still available from late mast crops. In the Intermountain West, denning occurs in October and November. Female denning typically peaks in late October while male denning peaks in mid-November. The dens are left in April and May. The timing is affected slightly by elevation of the den and aspect with the higher dens being left later. Beck (1991) noted females exited dens about 14 days later than males. The peak of den abandonment for males is late April and the peak for females is mid May.

Home Range

Black bears are generally active early and late in the day. In areas of human activity they tend toward being more nocturnal. Several may be found in areas where food is concentrated, but otherwise are solitary. Black bear home range size varies widely depending on sex of the bear and quality of habitat. Adult males may have a home range 5 times that of an adult female. Females ranges overlap other females, particularly their offspring. With their much greater range the males have up to 100% overlap with other males and their territories will include several females. This range overlap helps assure breeding of all the females. Subadult males that are searching for a home range may temporarily share territory with adult males and females. The resulting density of bears varies widely depending on habitat quality. A range from 0.15 bears per square mile in an Arizona study area to 1.7 in three disjunct areas in Virginia (Beck 1991) . For the western states the average is around 0.8 bears per square mile.

BLACK BEAR HABITAT ASSESSMENT **Rick Danvir**

Pelton (1982) characterized black bear habitat throughout its range as having “relatively inaccessible terrain, thick understory vegetation, and abundant sources of food in the form of shrub or tree-borne soft or hard mast (fruit and nuts)”. He summarized black bear food habits as “primarily grasses, forbs and insects in spring, soft mast in the form of shrub and tree-borne fruit in summer, and a mixture of soft and hard mast in fall”. The spatial arrangement, abundance, and dependability of seasonally important food sources may explain much of the variation in black bear density, fecundity, home range size, and seasonal habitat use throughout the range of the species.

The following is a review of information relating to black bear habitat, obtained largely from studies in Utah and other western states and provinces.

Food Habits

Understanding black bear food habits may be the key to understanding bear-habitat use. Foods eaten by black bear throughout their distributional range reflect the omnivorous feeding habits of the species. The spring diet consists primarily of grasses and forbs. The summer diet also includes grasses and forbs but includes increasingly more fruits as the season progresses. The fall diet consists primarily of a mixture of soft mast (fruits) and hard mast (nuts of deciduous and evergreen trees). Animal matter, primarily insects and carrion, generally comprises a smaller portion of the diet.

Spring (April-June) black bear diets in southwestern Colorado consist largely of grasses and forbs in oakbrush and aspen stands (Beck 1991). Bears in central and southeastern Utah forage on graminoids and forbs in aspen, aspen-conifer and mountain brush, as well as riparian areas and low elevation timbered canyon bottoms (Bates 1991, Richardson 1991). Aspen buds are frequently observed in spring bear scats in southeastern Utah. Ants, carrion, rodents and ungulates provide spring dietary protein sources in the Utah studies. Rodents, winter-killed and new-born mule deer comprise a significant portion of the spring diet in central Utah (Bates 1991).

Summer black bear diets consist of insects (primarily ants), grasses, forbs, and the flowers of some shrubs, until berries ripen. Fruits and flowers constitute the bear-food group highest in fats and carbohydrates (Richardson 1991). Larval ants are also high in fats and protein, and are sought by black bears in summer. Bears actively hunt ants when larvae occur close to the soil surface in response to warming temperatures (Bates 1991, Richardson 1991).

When available, berries are heavily used by bears during summer months. Although berries are eaten by bears prior to ripening (Tisch 1961), most use occurs after fruits ripen. In Utah, areas likely to produce abundant berries include canyon bottoms with perennial water, where species such as elderberry (*Sambucus* spp.), currants (*Ribes* spp.), raspberries and thimbleberries (*Rubus* spp.) and others frequently occur. In the low to mid-elevation mountain brush types, species such as squawapple (*Peraphyllum ramosissimum*), serviceberry (*Amalanchier* spp.) and others (Table 1), ripen in mid-summer and can provide an abundant source of food. Berry producing shrubs found at higher elevations are most productive in aspen stands, riparian areas, timber cuts, and along the edges of conifer stands in central and southeastern Utah, and southwestern Colorado. Aspen, mountain brush and oakbrush habitats supplied summer forage for bears (Beck 1991, Bates 1991, Richardson 1991).

Fall diets are comprised largely of berries and hard mast. Berries ripen first at lower elevations and somewhat later as elevation increases. Seasonal bear movements may

reflect their tracking of ripening fruits (Amstrup and Beecham 1976). Chokecherry (*Prunus virginiana*), which tends to bloom and fruit later than other brush species at similar elevations, is used heavily when available in Utah, Idaho and Colorado (Amstrup and Beecham 1976, Beck 1991, Bates 1991, Richardson 1991).

Hard mast species consumed by bears in Utah include gambel oak acorns *(Quercus gambelli*) and pinyon pine nuts (*Pinus edulis*). Fruits of these two species ripen somewhat later than the berry producing species (Table 1). Bears foraging at higher elevations, or in areas which do not contain oak, may make long movements to lower-elevation oakbrush communities in years when acorns are produced (Pelton 1982, Kellyhouse 1977, Beck 1991). Bears often remain in these areas until denning if mast is abundant. Bears feed heavily on hard and soft mast in the fall, prior to denning, and are physiologically capable of immense weight gains in a few weeks. Pinyon pine seed was reported as a bear food in the mountains of southeastern Utah, and the plateaus of the southern Dixie National Forest (Danvir et al. 1983). Bears may respond to abundant pinyon nut crops as they do to abundant oak mast. Seeds of other pines, most notably whitebark pine (*Pinus albicaulis*) are used heavily when available in Montana (Tisch 1961). Limber pine seeds (*Pinus flexilis*) are also eaten in Montana, and may provide food for bears in Utah as well.

Factors influencing production of both hard and soft mast include temperature, light, moisture, soil nutrients, insect predators and disease (Shopmeyer 1974). Freezing temperatures during the flowering period and extreme dryness during spring and summer appear to significantly affect mast production. Either of these conditions may result in nearly complete crop failure. Although data concerning the frequency of catastrophic mast failures is lacking, interviews with commercial seed collectors and survey respondents estimated ten-year intervals between abundant acorn crops in portions of Utah (Danvir et al. 1983). Bates et al. (1991) observed oak mast failure in central Utah during all three years of their study. Beck (1991) and Richardson (1991) observed concentrations of bears in patches of abundant acorn production.

Physical Characteristics of Bear Habitat in Utah

Elevation: In a survey of bear observations recorded by resource managers in Utah, eighty percent of bear survey observations occur between 2130 m (7000 ft) and 3050 m (10,000 ft) (Danvir et al. 1983). About 12% occur between 1400m (4600 ft) and 2130 m , and 8% occurred between 3050 m and 3650 m (12,000 ft). The only geographic unit in which the elevational distribution of observations differed markedly from this trend was in the Bookcliffs east of Desolation Canyon where elevation rarely exceeds 2440 m (8000 ft). Bears were commonly observed below 2130 m (7000 ft) in the eastern Bookcliffs.

Table 1. Plant species used as food items by black bears in Utah.

Species	Flowering Dates	Fruit Ripening Dates	Interval (yrs.) Between Abundant Berry Crops	Habitat and Distribution
Serviceberry (Amalanchier spp.)	May-June	July-August	1-5 yrs.	Common in arid areas, in canyons and foothills, 4000-8000 ft. (1220-2500 m)
Bearberry or manzanita (Arctostaphylos spp.)	March-May	June-August	Annually	Dry-moist soils, usually grows in association with lodgepole or Ponderosa pine in Utah
Squawapple (Peraphyllum ramosissimum)	May-June	June-July	Annually	Dry foothills and mountain slopes, well-drained soils, 4000-9000 ft. (1220-2750 m)
Chokecherry (Prunus virginiana)	May-June	July-October	2-5 yrs.	Widely distributed, esp. abundant along streams and moist canyon bottoms 4500-8000 ft. (1370-2500 m)
Currant (Ribes spp.)	April-June	June-August	2-3 yrs.	Exposed slopes and ridges 4000-11,000 ft.(1220-3350 m)
Raspberry Thimbleberry (Rubus spp.)	May-July	July-September	Annually	Widely distributed, wooded and open slopes alike, 5000-11,000 ft (1520-2900 m)
Elderberry (Sambucus spp.)	April-July	July-September	Annually	Commonly found along streams and canyon bottoms, moist soils, 5000-9500 ft. (1520-2900 m)
Buffaloberry (Shepherdia spp.)	April-June	June-August	1-4 yrs.	S. argentea found along streams and river bottoms 3000-7500 ft. (1000-2300 m). S.rotundifolia found on steep, rocky slopes, 5000-8000 ft. (1520-2500 m)
Snowberry (Symphoricarpos spp.)	June-August	August-October	Annually	S. longiflorus and S. rotundifolius found in rocky slopes, canyons and valleys 4000-10,000 ft (1220-3100 m) S. orephilus andS. alba found on wooded mountain slopes, valleys and riverbanks 5500-10,000 ft. (1650-3100 m)
Whortleberry or huckleberry (Vaccinium spp.)	June-July	June-September	Annually *poor berry production	Largely restricted to Uinta Mountains, grows on forested slopes 7000-12,000 ft. (2100-3650 m)
Pinyon pine (Pinus edulis)	June	September	2-10 yrs.	Dry, rocky foothills and mesas, 5000-7000 ft. (1520-2100 m)
Gambel oak (Quercus gambellii)	February-May	August-October	5-10* yrs,	Widespread, 4000-8000 ft. (1220-2500 m), central and southern Utah. Dominant tree on dry foothills and canyon walls, but best stands grow on moist, rich well-drained soils

Bears in central Utah use low elevation (2165 m) mountain brush in summer and higher elevation (2180 m) aspen and conifer in spring and fall (Bates 1991). Bears in southeastern Utah are similarly found in higher elevations spring and fall (2660-2700 m) and lower elevations (2500-2600 m) in summer (Richardson 1991). In contrast, bears in southwest Colorado use low elevation oakbrush (2500-2600 m) spring and fall, summering in higher elevation aspen communities (2700 m) (Beck 1991). Similar patterns of low elevation use in spring and fall, with higher elevation use in summer has been observed in Idaho (Amstrup and Beecham 1976, Reynolds and Beecham 1977).

Topography: Most observations of black bear occur in areas of marked topographic relief. Eighty-five percent of those who responded to a survey on Utah bear observations indicated that bears were generally found in areas with steep, rugged topography including mountain slopes, cliffs, escarpments, and canyons (Danvir et al. 1983). Forty-three percent stated bears were most frequently observed in and near canyons, regardless of elevation.

In studies performed in Idaho, Utah and Colorado, black bears predominantly used steeper, more rugged topography and made seasonal elevational movements in response to food resources (Amstrup and Beecham 1976, Bates 1991, Richardson 1991, Beck 1991). Bears in central Utah used progressively steeper slopes as the year progressed, bears in southeastern Utah and southwestern Colorado made significant use of canyons.

Moisture: Although black bears obtain winter metabolic water from fat stored the prior fall, they require free water during the summer. Richardson (1991) found bears using areas closer to water in the fall and areas farthest from water in spring. Bates (1991) found bears, especially females, associated with creeks in spring and summer. Survey results (Danvir et al. 1983) indicated that bears in Utah most frequently occurred in areas containing moist soils and associated vegetation. Eighty percent of observations recorded in this survey fell within areas characterized by moist to wet soils. Forty-seven percent of observations were associated with perennial water, primarily streams in canyon bottoms. Soils within frequently used bear range are typically loamy soil associations on mountains and plateaus that receive sufficient precipitation to remain moist through all or part of the summer months (Wilson et al. 1975). Precipitation level and soil characteristics largely dictate vegetative composition and availability of succulent forage. Vegetation types occurring on moist soils, such as riparian woodlands, wet meadows, mountain meadows and aspen provide year-round bear foraging areas for grasses, forbs and soft mast (Jonkel and Cowan 1971, Kellyhouse 1977, Pelchat and Ruff 1983, Smith and LeCount 1983, Beck 1991).

Food shortages resulting from summer droughts may affect the manner in which bears use their range. Annual home range sizes can double when food is scarce (Pelchat and Ruff 1983). Summer drought was believed to have resulted in the dispersal of black bear cubs and yearlings out of the Bookcliffs into lower elevation areas in September and October of 1976 (Fair 1977).

Vegetation: Interspersed oakbrush, mountain brush, aspen and conifer communities tend to be used year-round in Utah and southwestern Colorado (Danvir et al. 1983, Bates 1991, Richardson 1991, Beck 1991). Black bears in southern California prefer canyon oak habitats for food and cover year-round (Novick et al. 1981). In Alberta, aspen communities are considered to be the most important plant community for black bears (Pelchat and Ruff 1983), containing important food items and used year-round.

Large contiguous stands of mature conifers, such as the dense lodgepole pine

(*Pinus contorta*) stands on the Uinta Mountains, and high elevation spruce-fir stands (*Picea engelmanii-Abies lasiocarpa*) were generally felt by bear survey respondents to support low bear densities (Danvir et al. 1983). Most observations in extensive coniferous forests occurred in canyons, where the diversity and interspersion of vegetative types is generally greater. Jonkel and Cowan (1971) found black bears in Montana preferred spruce-fir communities to lodgepole pine and were generally associated with forest edges. Bears used all seral stages of the spruce-fir/pachystima association, except recent burns and clearcuts. Barnes and Bray (1967) estimated bear density to be greater (1.4 bear/mi.^{2}) in a spruce, fir, whitebark pine, aspen and meadow interspersion than in monotypic lodgepole pine (1 bear/ 20 mi.^{2}). Bears in central and southeastern Utah preferred mesic, north-slope conifer patches and 'stringers' as resting areas year-round (Bates 1991, Richardson 1991).

Most bear survey observations in pinyon-juniper woodlands were reported from the Bookcliffs, LaSal Mountains, and Abajo Mountains, where mast-producing mountain brush species intermix along mesa rims and in canyon bottoms (Danvir et al. 1983). Richardson (1991) noted use of pinyon-juniper primarily by adult male bears in late fall.

There appears to be little black bear occurrence above timberline or in sage-steppe. However Black (unpublished data) has observed bears hunting ants in sagebrush stands. Infrequent use of these types, particularly by females with cubs, may be due to lack of security cover. Both black and grizzly bears are believed to have evolved from a common forest-dwelling eurasian ancestor (*Ursus etruscus*) (Herrero 1972). Ancestral grizzly bears evolved to an open-ground dwelling species, where aggressive behavior became the principal means of protection from other predators. Black bears continued to evolve in woodland habitats, therefore tree-climbing behavior offered protection (Herrero 1972). Climbable trees or shrubs provide security to black bears, particularly females with young. While male bears will utilize sparser Arizona chapparal, females with young remain in denser stands of riparian woodland or shrub oak, presumably for security as well as forage advantages (Smith and LeCount 1983). LeCount et al. (1984), Bates (1991) and Richardson (1991) found black bears preferred shrub dominated feeding sites having dense horizontal cover. Bears in southeastern Utah selected areas of dense cover within all vegetation types, and by all sex and age classes, especially females with cubs (Richardson 1991).

High interspersion of preferred habitat types (such as aspen, conifer and brush patches) may improve bear-habitat quality. Richardson (1991) found bears and bear foods more common along patch edges in summer. Jonkel and Cowan (1971), Lindzey and Meslow (1977) and Bates (1991) similarly found bears associated with edges.

Females with cubs, as a group, tended to select areas having a rich diversity of plant species, a high interspersion of plant communities, proximity to water, hiding and climbing (escape) cover, and areas removed from roads (Bates 1991, Richardson 1991). Females used high elevations more than expected (Richardson 1991). Females utilized steeper, moister, higher elevation, more species-rich sites than did male bears.

Accessibility: Most survey respondents (85%) indicated that black bear observations generally occur in rugged canyons, on plateaus and mesa rims, and steep mountainous areas which are not accessible by vehicle and with little human use (Danvir et al. 1983). Black bears avoided roads in summer and fall in an Idaho study (Young and Beecham 1983). Bates (1991) noted that female bears avoided roads during spring. Bears of both sexes avoided roads and trails in fall. Young (1995), however, noted significant use of roads by bears in the Bookcliffs, and in fact used tracks on roads as an abundance index.Females tended to den in areas removed from human activity, and remain in these areas during spring. The apparent association of bears with canyons and similar steep, rugged topography may be related to several factors. Bears studied in mountainous terrain exhibited seasonal elevation shifts dictated by the abundance and phenological development of forage species (Amstrup and Beecham 1976, Bates 1991). Within the elevation range that most bear observations occur, a wide range of topographic relief results in a greater interspersion of aspen, mixed conifer, and mountain brush. Bears may be able to obtain seasonally abundant foods within smaller home ranges in areas characterized by canyons than in terrain with less topographic relief. Areas with less relief may necessitate longer movements by bears to obtain seasonally abundant foods. Canyons and escarpments may serve as security cover as well as allowing bears to travel through areas which are otherwise heavily used by humans.

Denning habitat: Bears in Idaho, Arizona, California, Colorado and Utah primarily den in excavated or naturally occurring chambers in hillsides, under rocks, trees or shrubs (Beecham 1980, LeCount 1980, Novick et al. 1981, Beck 1991, Black pers. comm.) Bears in southwestern Colorado denned in all elevations and plant communities (Beck 1991). Bears in central and southeastern Utah generally denned at higher elevations in aspen or coniferous habitats (Bates 1991, Richardson 1991). Den sites are often located on steeper slopes, in areas of minimal human disturbance (Novick et al. 1981, Bates et al 1991, Beck 1991).

Relationship between food, seasonal movements and home range size: Resident black bears apparently make short-term exploratory excursions into ‘new’ territory periodically throughout the non-denning period (Amstrup and Beecham 1976, Pelchat and Ruff 1983, Beck 1991). **Tthese activities allow bears to discover changes in food availability and distribution through time. Studies in the mountainous portions of Idaho, Utah and Colorado (Amstrup and Beecham 1976, Reynolds and Beecham 1977, Bates 1991, Richardson 1991, Beck 1991) describe predictable, seasonal movements (in elevation and between vegetation types) in response to vegetation growth, flowering and fruiting of preferred bear foods. Rather long excursions to abundant, but patchy, chokecherry and oak mast crops have been observed in the Idaho, Utah and Colorado. Tolerance of other bears apparently increases at abundant food sources. Richardson (1991) observed 9 telemetered bears feeding in a 3 ha patch of acorn-rich Gambel’s oak. Beck (1991) observed annual migrations of bears from summer ranges lacking oakbrush into areas with abundant mast. These bears commonly moved distances of 15-40 km to feed for several weeks prior to denning. Beck (1991) describes bears

residing in a 500-1000 km^2 area concentrating in a single 25 km^2 oakbrush stand each fall. Pelchat and Ruff (1983) saw similar 27 km movements by bears to preferred seasonally abundant foods.

Lindzey et al. (1983) found that home range size of black bears in coastal Washington (coniferous forest) is influenced by food availability resulting from successional changes following logging. Bears selected more recently logged areas where berry producing shrubs (and berries) were most abundant. Home range sizes were smaller, and bear density greater, in more recently logged habitat dominated by early seral stages.

Relationship between food, fecundity and bear density: Studies in forested habitats suggest that food supply influences bear fecundity and density. Lindzey et al. (1983) noted a rapid population increase and high cub production following a period of logging on an island in coastal Washington. Bear density and cub production declined as preferred bear food plants were replaced by coniferous trees. Rogers (1987) determined that the principal non-hunting factor limiting bear density was starvation of cubs and yearlings, and nutrition-related reproductive failure of adult female bears. Research from Montana (Jonkel and Cowan 1971) and Colorado (Beck 1991) suggest that fall food availability influences fall bear condition (weight) and subsequent cub production. Cub production in the Bookcliffs similarly appears to be dependent on prior-year food availability and body condition of breeding-age females (Black, unpublished data).

Management of Black Bear Habitat

Management of plants and plant communities involves using human creativity in the application and manipulation of the following "tools" and processes; succession, fire, rest, grazing (herbivory), animal impact and technology, to achieve desired conditions (Heady 1975, Savory 1988, Augustine and McNaughton 1998). Successful management of black bear habitat requires sound vegetation management, management of access and behavior of recreationists in "bear country", and maintaining connectivity between seasonally important large blocks and patches of habitat.

Forest management: Forested habitats supply escape and resting cover, food, and denning habitat to black bears. Aspen stands are probably the most important forest community in Utah, providing both cover and food. Aspen communities can provide abundant herbaceous forage, berry production and animal matter (insects and ungulates) for bears. Coniferous forests appear to have high cover values, but lower food value. Successional replacement of aspen stands by conifers can significantly reduce bear-food production in aspen communities. Both fire and selective logging of conifers can be used to maintain aspen vigor.

In portions of the state where conifer stands are uncommon, large-scale logging may be detrimental to bears (Bates 1991). Since black bear foods are often abundant on forest

edges, selective cuts appear to be preferable to clear cutting of timber (Young and Beecham 1983, Hugie 1983). Small-scale openings in timbered habitats, providing early-seral shrub-borne mast and herbaceous forage in close proximity to cover, can be beneficial (Lindzey and Meslow 1977, Young and Beecham 1983, Hugie 1983). Hugie (1983) found bears preferred abandoned roads and small clearings having early seral stage growth, but avoided clearcuts greater than 6 ha in size. Young and Beecham (1983) found bears used shrub fields resulting from selective cuts more than expected in spring and summer, but avoided clearcut areas all seasons.

Mountain shrub communities containing oak, chokecherry and other mast-producing species should be managed to avoid successional shifts to pinyon-juniper monocultures. Fire, selective cutting and mechanical treatements can all be used to retard succession to pinyon-juniper. Dependable mast-producing areas should be identified and managed for taller, older-age shrubs to maintain fruit production despite browsing by wild and domestic ungulates. While many mast-producing shrub species will vigorously resprout and produce fruit following winter defoliation by ungulates, excessive growing season utilization can significantly reduce both foliage and fruit production (Willard and McKell 1978, Kay 1995). Animal density of both wild and domestic herbivores should be managed to maintain diversity and vigor of both woody and herbaceous vegetation in all seasonally important vegetation types. Season-long livestock grazing can have negative impacts on both woody and herbaceous vegetation. Season long grazing may reduce seasonal bear food availability and increase the likelihood of predation. Jorgenson (1980) found bears and sheep competed spatially and temporally for food and space when grasses and forbs were limited, resulting in depredation, dead sheep, and dead bears. Conversely, livestock grazing can be used to reduce herbaceous competition, reduce suckering and promote apical dominance and seed production in shrubs (Urness 1990). Herded livestock, which are moved across the landscape, can maintain herbaceous plant diversity and vigor, and may reduce opportunities for predation.

Recreation management: Minimizing road density, human habitation and human access in high quality bear-habitat should reduce human contact with bears. Minimizing contact should increase longevity of breeding female bears, since they tend to utilize smaller ranges in less accessible areas when possible (Bates 1991, Beck 1991).

Graber and White (1983) noted that black bears in the coniferous forests of Yosemite spend a disproportionate amount of time near people and their high quality concentrated foods. Bear diets are generally high in carbohydrates and lacking in fats and protein. Consequently, bears seek out not only animal matter, but also human foods and garbage at campsites (Pelton 1982). Bears feeding on protein-rich sources (like contents of campground dumpsters) show significant weight gains (Rogers 1976). Augmenting bear habitat with human food-sources can result in increased size, fecundity and density of black bears (Herrero 1980). Since bears are extremely curious and learn quickly, it is important to avoid introducing these high quality food sources into bear habitat. Once bears become successful at exploiting human food-sources,

they will continue to do so. With increased recreational demand in Utah's forested lands, education and enforcement of rules designed to minimize bear-access to human food-sources is essential in order to have both recreation and viable bear populations in bear country.

Landscape management: Successful bear management requires maintaining an adequate density of breeding females in high quality bear habitat. High quality bear habitat in Utah may be characterized as large interconnected blocks of land exhibiting high interspersion of aspen, mountain brush and coniferous plant communities with a healthy herbaceous and shrubby component; well connected movement corridors between seasonal food sources and less accessible areas with variable topography. This requires management and planning at multiple scales, i.e. managing for healthy plants at the patch level, and managing at scales large enough to allow movement between blocks of important habitat. Connecting seasonal food sources maintains bear-condition, production and density; connecting habitat blocks maintains genetic diversity.

Management of black bears and other large, low-density mammals requires GIS-based inventory, planning and education in coordination with state and county governments, and public and private landowners. However, money spent on such an approach can benefit multiple large game species (bear, deer, lion, elk, moose, sheep, etc.) as well as smaller terrestrial species. Proactive identification and management of permanent movement corridors between habitat blocks will require coordination of efforts and funding between state, federal and private conservation funds. UDWR must actively plan and interact effectively with agencies, governments and private entities in order to maintain space and connectivity for viable bear populations. Effective management for quality bear habitat will increase plant and wildlife diversity, enriching the ecological and economic well being of the citizens of Utah.

MONITORING UTAH BLACK BEAR POPULATIONS — Hal Black

Historical aspects: From 1969 to 1985 the number of black bears annually harvested in Utah was relatively constant, never exceeding more than 50 individuals (Pederson and McDonald, 1990). Throughout this same time period there was a gradual increase in the number of hunters purchasing permits. Starting in 1986 and continuing through 1989 there was a rather dramatic increase in hunters which resulted in more bears being killed. For example, the total killed during this four-year period was about 267. The greatest number of bears killed in any combination of four years prior to 1986 was around 148.

Motivated in part by fear of over-exploitation of Utah's black bears, limited entry hunting and bear hunting units were established in 1990, and hunters had to draw for permits. The consequence of this management decision was a dramatic decrease in bears harvested throughout the state (only twenty-two killed in 1990). From the 1990 low to the present, harvest numbers have risen due partly to a gradual increase in permits

issued and improved hunter skills. Since 1975, UDWR has kept records of sex ratios in the harvest and since 1980 determined the age of bears killed. Only once between the years of 1985 and 1996 have females exceeded males in the harvest. Inspection of age structure by year indicates no profound differences and although the majority of bears harvested are eight or younger, older bears in their teens are regularly taken.

Aside from hunting, the only other primary source of human caused bear mortality is from depredation control activities of the Wildlife Services (WS), of the U.S. Department of Agriculture, who kill bears and other predators responsible for livestock predation. Depredation harvest since 1972 has been a fairly small percentage of total annual harvest of bears. But since 1990, take of depredating bears has increased, reaching unprecedented levels in 1998 when WS personnel killed 36 bears compared to a sport harvest of 44 (Bates and Henry, 1998).

The primary parameters used for monitoring Utah bear population include: the total number of bears killed by legal harvest, depredation, auto accidents, hunter effort, and sex ratios and age structure of harvested bears. These parameters have served the DWR fairly well in spite of the numerous short-comings of these measures of population structure and dynamics (Garshelis 1991).

New Monitoring Techniques: However well techniques have served in the past, the changing human landscape in Utah and the competing demands for wildlands suggest the need for a better system for assessing bear populations; one that is sensitive to the diverse habitats where bears occur and is consistent with available resources (money and man-power).

New methods for monitoring bears should include the perpetuation and sophistication of techniques currently employed, additional monitoring techniques, and a sound statistical analysis of the existing good data sets of sex ratios, age structures, and hunter effort that current and past monitoring has produced. This analysis may demonstrate a rather stable population over the past 20+ years and could serve as a baseline for comparison of the effectiveness of future management strategies.

Techniques could include the following:

- Continued evaluation of age structure by pre-molar tooth removal and age determination by cementum annuli analysis of all bears killed for whatever reason.

- Estimation of reproductive performance of breeding age, females through examination of cementum annuli.

- Refinement of sex determination techniques by all personnel (UDWR, WS, researchers and landowners) involved in killing or confirming kills of bears—thus improving the sample size for sex ratio analysis.

- Establishment of an annual fall bear food evaluation system state-wide that determines prevalence and productivity of the 10-12 plants important for bears in the pre-hibernation fall "fattening" period of their annual cycle. This technique has proven successful in Minnesota where all field personnel from state and federal agencies are asked to evaluate fall foods (Noyce and Garshelis, 1997).

- Establishment of bear track transects in several of the more productive bear hunting units to monitor bear presence and level of activity. The Book Cliffs roads have been shown to lend themselves well to road transects (Young, 1995) and preliminary work on the Abajo Mountains/Elk Ridge **is** was promising, yielding forty-three black bear track sets in five days of sampling (Black, unpulished data 1996).

Problems and Concerns with New Monitoring Methods

Collecting Data on Bears That are Killed: Given that the number of bears killed for whatever reason is small compared to most other states in the west, it is imperative that biological data taken at the time of kill be religiously recorded and summarized annually. For example, WS failed 19% of the time to report the sex of bears killed from 1994-98 (Bates and Henry 1998). The sex of 26 bears was not determined.

When and Why To Assess Food Supply: Some of the first large fruits to mature in summer months are squawapple, (Anger 1994) raspberry, and strawberry. Chokecherry, currant, serviceberry, acorns and pinyon are late summer/fall foods that contribute significantly to fall weight gain. Field personnel should make their evaluations of these major bear foods and several others when most are at or near peak productivity.

The reproductive performance of female bears is dependent upon food supply, which influences age of first reproduction, litter size, survival of young, and differential productivity as a function of age. Given these reproductive parameters and the fact that cub and yearling mortality can be high and recruitment low (Tolman 1998), black bears can never be expected to occur in densities common in large ungulates. Proper management then demands that effort is made to annually evaluate their food supply.

When and Why to Conduct Track Surveys: A dry powdery dirt substrate on secondary and tertiary roads is best for detection and measuring of tracks. In Utah, mid-June to mid-July is probably the best time to survey prior to late summer rains that leave roads compacted. Equipment and techniques to prepare road surfaces and count tracks are found in Young (1995). Establishment of bear track transects has been shown to be feasible by work in the Book Cliffs and Abajo/Elk Ridge mountains. (Young 1995). Counting tracks and measuring front pad widths provide a population sample of bear activity and occurrence. This technique of monitoring has the added advantage of simply observing natural bear movements without the inherent problems associated with trapping or habituating individual bears to a man-made source of food or a

chemical lure. It would have been the monitoring technique of choice in coastal North Carolina had road conditions been adequate (Warburton 1992).

Other Monitoring Techniques and Density Estimates: Techniques for monitoring bears such as mark-release and re-capture or re-identification without capture, scent or bait stations transects, and sighting of bears or their sign, all have drawbacks and limitations (Garshelis 1991,1993). Some require considerable time by field personnel and large expenditures of money: interestingly however, in spite of their shortcomings, most bear populations throughout North America are judged to have been managed adequately with these methods (Garshelis 1991). Recent attempts to fingerprint bears by analyzing DNA extracted from hair may be useful (Pelton 2000). Large scale efforts to estimate bear densities have been successful but are costly (Garshelis and Visser, 1997).

Appendix II contains a bear population model based on density estimates found in the Book Cliffs. After examining the home ranges of radio-collared females within this study area, and extrapolating the number of cubs and boars, it was determined there were approximately 0.2 bears per square mile. The amount of bear habitat in each hunting unit in Utah was estimated by determining the number of acres of vegetative types used by bears above 7000 feet. Vegetative types were divided into medium and high value, and based on the Book Cliffs study, populations were estimated based on 0.1 bears per mi^2 in medium value habitat, and 0.3 bears per mi^2 in high value habitat. Another method compared the relative harvest of sport and depredating bears to the number taken annually in the Book Cliffs. Density estimates using this method ranged from 0.0001 to 0.3 bears per mi^2.

MANAGEMENT HISTORY

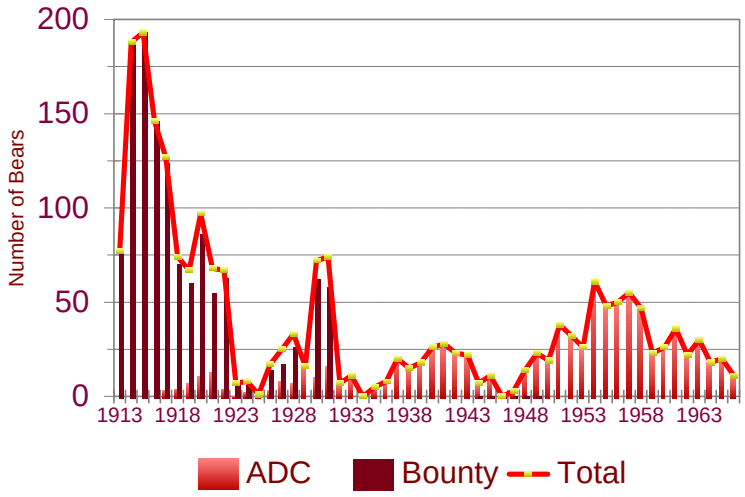
Bill Bates

Black bear management in the intermountain west began to take shape with the journey of Meriweather Lewis and William Clark to the Pacific Ocean in 1804-1806. During their excursion, they encountered numerous grizzly and black bears (Ambrose 1996). Fearing attacks on members of their company, and out of a need for food, most bears encountered were killed.

Following the Lewis and Clark expedition, mountain men and trappers ventured into the western mountains. During the Rocky Mountain fur-trade era, there are several references of hounds amongst the mountain men and Indians (Sweet 1999). Early Texan Ranger, “Bigfoot” Wallace, was an avid cougar and bear hunter. General George Armstrong Custer was known to take his hounds with him on campaigns.

President Theodore Roosevelt, a pioneer in the field of conservation, went on two excursions to hunt cougar and bear in the western Rocky Mountains. He hunted with renowned houndsmen, Ben Lilly and Johnny Goff (Sweet 1999). Many of these early houndsmen, including Lilly, Albert Pickens, and Walt Hotchkiss, among others, were hired by the U.S. Biological Survey as ear;u as 1914. These men provided information

Figure 1. Black bears taken by federal hunters or bounty in Utah, 1913-66.



about the biology and distribution of black bears in the intermountain west.

The first written record of bear in Utah was in 1847. A hunting party was organized by early Mormon settlers in December to address serious livestock depredations. They killed 2 bears (Rawley 1985). The next was by Jules Remy in 1855. He included both black and grizzly bears in his listing of the mammals of Utah (Remy 1861). Bears were also included in a list of species for which a bounty was authorized by the Utah Territorial Legislature in 1888. Bounties were recorded sporadically from 1913 to 1949 (Durrant 1952). The highest number of bears turned in for bounty were recorded in 1915, with 193. The number of bears bountied declined over the years, averaging 54 per year (Figure 1). The number of bears taken by government hunters increased gradually beginning about 1937, averaging 18.6 for the period, with a high of 61 taken in 1954. No bears were taken in 1923, 1934 and 1946.

As a result of efforts by houndsmen, in 1967, the Utah State Legislature changed the status of black bear from predator to a protected wildlife species. In January 1967, the Utah Fish and Game Commission declared the bear to be a game animal and established hunting regulations (Bowden 1974). During 1967, 1968 and the first half of 1969, bear could be taken by stalking or the use of hounds in any number and at any time except during the eleven day regular deer season. No license was required for residents or non-residents. An emergency closure on the Book Cliffs from June 1 through June 30, 1969 was the only exception.

In 1970, a bear permit could be purchased for $1. The season ran from May 15 through October 15. The northern part of the state was closed to taking black bear. The season length remained the same through 1975, but the price for residents permits increased to $15, and to $100 for non-residents in 1972. Non-residents were required to use a guide. Cougar/bear pursuit permits were issued for the first time in 1975.

In 1976, the bear hunt was split into two seasons, April 15 through June 15, and September 1 through October 15. This was done to allow hunters to take bears when pelts were prime. This continued through 1979. In 1979, baiting was authorized as a legal method to take bears. The spring season was extended to June 30 in 1980, to

July 31 in 1982, and reduced back to June 30 in 1983. In 1984, it was reduced further, back to June 15. The season length remained the same through 1989. However, permit prices were raised to $25 for residents and $150 for non-residents in 1985.

As a result of increasing numbers of bear hunters, a state-wide limited entry permit system was implemented in 1990. This required all hunters to draw a permit and hunt a specific unit. This reduced the number of hunters from 687 in 1990, to 142 in 1992. The season was split into 3 seasons, running from 4/14 to 6/3, 9/1 to 10/16, and 11/1 to 11/30. Permit prices were raised to $53 for residents, and $253 for non-residents. Season dates and permit levels remained constant through the 1992 season.

Due to public concerns over the potential of orphaning dependent cubs, the Utah Wildlife Board eliminated the spring bear hunt in 1993. The fall season was continued, from September 1 through October 2, closing during general season big game hunts, and reopening from November 1 through the 30th. With minor variation of season dates annually and a continued increased in the number of permits, bear hunting continued with a fall hunt, allowing both hounds and baiting, through the 2000 season. Bear pursuit was still allowed from April 15 through June 4, and during fall bear seasons.

After elimination of the spring bear hunt, there was an increase in the proportion of females in the harvest (Table 2; Figure 2), as well as an apparent increase in the number of bears taken by Wildlife Services during summer months that were involved in livestock depredation. Although it cannot demonstrate cause and effect, chi-square analysis found significant differences in the percent hunter success, percent females in the harvest, and the number of bears taken annually by Wildlife Services due to livestock depredation recorded during each of the three season types (P=.95).

Figure 2. Sex of black bears taken in sport harvest in Utah, 1975-99.

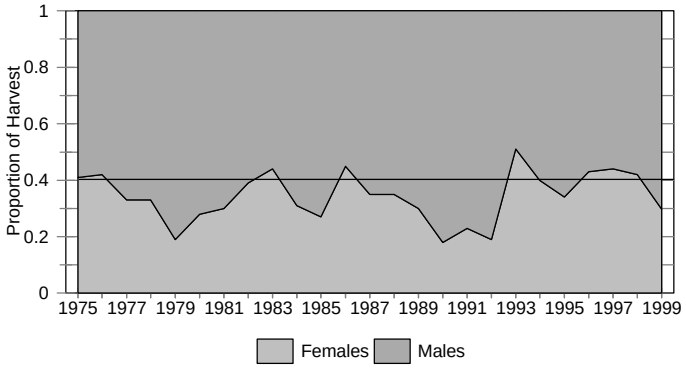


Table 2. Effects of season type on black bear harvest in Utah.

Treatment	Percent Success	Percent Females	Wildlife Services Average Take
Spring, Fall Season, Unlimited Tags	16.4%	34.1%	9.3
Spring, Fall Season, Limited Tags	24.6%	20.0%	18.7
Fall Season, Limited Tags	28.7%	40.4%	29.7

NUISANCE MANAGEMENT **Allison Jones**

In the early days of Utah management of native animals, black bears were managed primarily as a nuisance species. In 1888, the Utah territorial legislature passed a bill that initiated bounty payments on "obnoxious animals," including bears (Rawley 1985). Following statehood in 1896, the first state legislature upheld this earlier bounty and provided for rewards for bear of not less than five dollars nor more than ten dollars.

As a result of a petition by houndsmen in 1967, the status of black bear was changed the from that of a predator, to protected species. However, a change in status did not change the fact that many black bears posed a problem to many livestock growers, bee keepers, and other Utah residents. In fact, as the human population of Utah grew, it was evident that nuisance bear problems and conflicts were also on the rise.

In the last few years, there has been a considerable trend of increased livestock losses to bear (primarily sheep), depredation occurrence by bear, and black bear take by Wildlife Services (Tamlos and Bodenchuk 1999). From 1967 to 1986, the average number of black bear taken by Wildlife Services was about eight bears per year. During the period 1987 to 1998, this number jumped to about 25 bears per year (UDWR 1999b). Even within this last decade it is clear that the trend is still on the rise. The occurrence of black bear predation on livestock has increased roughly 50% from 1994 to the present, though most of these increases occurred in only six counties. These increases are in spite of declining livestock numbers during the same period (Mike Bodenchuk, pers. comm.).

How Agencies Handle Problem Bears

UDWR Management of Problem Bears: During this same period, UDWR developed an administrative directive outlining how to effectively address not only depredating bears, but all nuisance and problem bears in Utah. This directive was recently updated (UDWR 1999c). This document directs UDWR employees to take steps to reduce bear damage to private property and reduce public safety concerns as they relate to bears.

The administrative directive places problem black bears into three groups. Level One problem bears cause little or no damage to private property, such as bears that explore garbage or a campground. These bears are usually first time offenders. Solutions in the case of Level One bears involve removing the attractant (i.e. garbage or other food), or using hazing techniques and scare tactics (i.e. dogs, pyrotechnics or rubber bullets). If these methods do not work, DWR will eventually trap and translocate the bear not less than 30 miles away if a subadult, and not less than 50 miles away if an adult.

Level Two bears are those that continue to be involved in unacceptable behaviors, even after hazing and relocation techniques were used when the bear was in the Level One stage. Level Two bears again engage in "Level One activities" and do not pose an

immediate threat to public safety or livestock. With Level Two bears, the solution is destruction of the bear, usually via a kill permit issued to the landowner, or via a hunter with valid bear permit. Exceptions include young of the year in which the policy is to trap and hold the bear until it can be placed in a den to hibernate; or a female with cubs, in which case the Division's policy is to trap and move the family.

Level Three bears are chronic or acute offenders that have caused significant property damage or are a threat to human safety. The prescribed solution is destruction of the bear, usually by Wildlife Services, with which the DWR has a Memorandum of Understanding. In cases where livestock are killed, a depredating black bear is never trapped and relocated under any circumstances. Ranchers can also take bears that are depredating on their livestock.

For the most part, two out of three nuisance bear management scenarios involve destruction of the bear (except for a couple of exceptions with Level Two bears). DWR's tendency to move towards this solution overshadows another possible solution for nuisance bears: preventive techniques. Preventative techniques are only touched on in the DWR administrative directive for dealing with problem bears, on page 3:

> *"It is the intent of the Division that black bear management emphasize nuisance and predation prevention,"*

and on page 6:

"Regional managers <u>should</u> (emphasis added) *identify areas 'of risk' for depredation or nuisance problems and develop programs to remove attractants or otherwise alleviate conditions contributing to nuisance problems."*

Current UDWR policies address how to deal with bear damage situations, but do not completely address prevention of problems. Additional coordination and cooperation is needed between UDWR, federal agencies, and private landowners to take preventative measures which may alleviate problems with bears.

<u>APHIS - Wildlife Services' Management of Problem Bears</u>: This agency has a subordinate role in managing problem black bears in Utah. For the most part, Wildlife Services steps in to take or otherwise control depredating bears under direction of UDWR. However, it has recently taken the lead by providing non-lethal information to all livestock producers with whom it has agreements in Utah. This precedent, along with concern expressed in the Tamllos and Bodenchuk report (1999), support Wildlife Services' claim that they intend to reduce lethal control of black bears in Utah.

<u>USFS management of problem bears</u>: While this is another agency that claims a subordinate role in dealing with problem black bears in Utah, it is important to explore past management actions and concerns with bears on Utah's National Forests,

because this is where many of Utah's bears live. For the most part, the Forest Service has deferred to UDWR when a problem bear occurs on National Forest Land. Yet, there are management actions the USFS could take to reduce the occurrence of problem bears. Currently, there are no regulations or specific directions in place that require the National Forests in Utah to implement educational signs or install bear-proof garbage cans in campgrounds (Bill Burbridge and Colleen Madrid, pers. comm.). For the most part, these measures are not undertaken until a problem bear has already presented itself on a Forest (Rod Player, Rich Williams and Kathy Paulin, pers. comm.). Usually, by the time the bear is considered a problem, it will have already been relocated by UDWR or destroyed by Wildlife Services.

The USFS has enacted special regulations in other regions to deal with problem bears, most notably regulations recently enacted on National Forests in Wyoming and Arizona. In Wyoming, 36 CFR (Code of Federal Regulations) 261.50 prohibits leaving animal carcasses or food unattended in National Forests. Violators can be fined. In Arizona, 36 CFR 261.58 prohibits processing, storing, or discarding any food or refuse in an exposed or physically available condition to wildlife in the Coronado National Forest. While this regulation is also punishable by fine, it has never been enforced, even though Wildlife Damage Review has documentation that many fines should have been issued in the 1990's (Nancy Ziremberg, pers. comm.). Utah bear management would be improved if the Forest Service moves toward a more comprehensive policy in Region 4 in regard to pre-emptive measures such as public education, signage, and mandatory bear-proof storage containers and garbage cans.

Management of Problem Bears in Surrounding States

Arizona: Similar to DWR's hierarchy for nuisance bears, Arizona has three separate categories for problem bears (AGFD 1998). Category 1 bears are the most extreme case, and pose an immediate threat to human safety. These bears have injured people, have extensively damaged structures, exhibited abnormal or aggressive behavior, or are clearly unwilling to leave an area. The remedy in this situation is an immediate response which can include relocation if wildlife managers feel that action is appropriate. However, any bear that has injured a person, is injured itself, or is clearly habituated to human foods will be destroyed. In fact, if a bear has injured a person, any AGFD employee may authorize a member of the public to destroy the bear if AFGC is not available (AGFD 1998). Category 2 bears are not considered an immediate threat to people, but may pose a threat in the future (because the bear is willing but unable to leave the area, or has had some prior record of nuisance). The remedies for Category 2 bears include relocation, removing attractants, and public education. Category 3 bears are not considered an immediate threat to people. These bears have no prior record of nuisance, and the problems they tend to create are considered minimal (i.e. getting into garbage, etc.). The remedy for these situations is education of the public.

Handling of livestock depredation incidents in Arizona is variable. As with most state game agencies, AFGD has an MOU with Wildlife Services, who will control depredating

black bears after livestock have been killed. However, Arizona also has a policy in which livestock producers can destroy a bear as long as they provide immediate evidence afterwards of bear-killed livestock (ARS 17-302). In these depredation situations, no license or tag is required for the livestock owner to kill the bear.

Management of nuisance black bears in Arizona is now under much closer scrutiny because of an assault that occurred in 1996 on National Forest land on Mt. Lemon. The incident occurred after a 5-year old male bear was relocated away from a group campsite where it had been a nuisance. In a few days it returned, and in an unprovoked attack (no food on premises), entered Anna Knochel's tent, dragged her out, and started consuming her (Arizona Daily Star, July 26 1996). As a result of her injuries, she is now paralyzed. In response to the attack, the bear was immediately destroyed, and Forest Service officials closed several campgrounds in the area while 4 or 5 known camp-looting bears were captured and relocated. Furthermore, the Arizona Game and Fish Department has moved to a "two strikes-bear's out" policy for all nuisance bears (Colleen Madrid, pers. comm.). Following the attack, the victim's family sued both the state and the USFS. In 1999, the State of Arizona settled out of court with the family. The fact that the state of Arizona is claiming responsibility for the bear's action may be setting a worrisome precedent. The suit against the USFS is still pending, and there is no indication that they will settle out of court.

Colorado: The Colorado Division of Wildlife (CDOW) has issued an administrative directive that sets forth procedures to be followed in control and prevention of black bear damage, and in addressing public safety issues (CDOW, 1999a). This directive was also developed in the midst of recently increasing numbers of people-bear conflicts across the state. Like Utah, CDOW has three separate categories for problem bears, but these categories are different than Utah's (nuisance bears, depredating bears, and dangerous bears). Unlike Utah, there is not a specific prescription for dealing with the types of bears placed in each category. For example, a bear that is considered dangerous because of its location will be captured and relocated; a bear that is considered dangerous because of its behavior will be destroyed. Generally, CDOW operates under four management options for dealing with problem bears: 1) no management action combined with educational efforts, 2) deterrent combined with educational efforts, 3) capture and translocation, and 4) destruction. These management options are left largely up to the discretion of the CDOW employees involved with the situation. For example, the directive states that "any bear which kills livestock can (emphasis added) be destroyed" (CDOW 1999a).

Colorado's tendency towards integrating pre-emptive methods to avoid problems with bears is evident in many recent ordinances and directives in the state. For example, recent ordinances passed in Snowmass Village and Aspen have made bear-proof garbage cans mandatory in those municipalities, with fines of between $25 and $500 imposed on violators (CDOW 1999b). And the USFS in southwest Colorado implemented a regulation in 1996 requiring campers to keep food and trash away from wildlife (CDOW 1999b). Additionally, a directive published by CDOW in 1993 (and still

in effect) emphasizes public education and discourages trapping and moving of problem bears (CDOW 1998). This directive was established because it was clear that translocating problem bears was an inefficient solution, due to high bear return rates. This directive, which greatly increased public education about bears in Colorado, has had a major role in reducing human encounters with bears, and has been hailed by biologists as largely successful.

Idaho: As in other states, Idaho has different categories for nuisance black bears (IDFG 1998). Category 1 bears have caused minimal or no damage, and they are first time offenders. Hazing and other non-lethal techniques are appropriate to remedy this situation. Category 1 bears are not to be captured and relocated, except for instances when a bear finds itself in unsuitable habitat. Category 2 bears are former Category 1 bears that have returned to a problem area. They are clearly conditioned to human foods and are habituated to human presence. In this case the solution is increased emphasis on eliminating the attractant, and usually bear capture and relocation. Category 3 bears have caused significant property damage, and are a threat to human safety. These bears exhibit aggression or absolutely no fear of humans, bite or injure humans, are a nuisance during the daytime, and are chronic offenders. The remedy in this case is bear destruction. Category 4 bears are the same as Category 3, but unique circumstances exist which prohibit the use of culvert traps and snares, so a depredation kill permit is issued to the land owner.

As with other state game agencies, Idaho Fish and Game has agreed to share responsibility for handling depredation situations with Wildlife Services. However, Idaho's black bear management plan states that the responsible employee on a depredation site (either IDFG or WS) has the ultimate responsibility for deciding how to handle each depredation situation (IDFG 1998). Idaho's black bear management plan states "the responsible employee should provide the complainant with specific recommendations on how to prevent depredation problems" (IDFG 1998).

Wyoming: The Wyoming Game and Fish Department does not place its nuisance bears into categories. Rather, every effort is made to prevent unnecessary escalation of bear-human interactions through an ascending order of options and responsibilities (WGFD 1998). These steps include: 1) no management action (combined with education effort), 2) deterrent methods such as removal of attractant, or use of guard dogs or an electric fence (also combined with education effort), 3) aversive conditioning such as rubber bullets or pyrotechnics (also combined with education effort), 4) trapping and relocation by WGFD, and 5) destruction of the bear (by either WGFD or Wildlife Services).

This approach to problem bears is in accordance with emphasis of non-lethal control methods for nuisance bear management in Wyoming. This is evident through a comprehensive program on all campgrounds in Wyoming National Forests, in which the USFS and WGFD jointly provide educational materials designed to help avoid human-bear conflicts in campsites (WGFD 1994). Furthermore, in Wyoming's most recent

black bear management plan the WGFD recommended that lethal take be allowed only to prevent immediate damage to private property, and that non-lethal methods be used where ever feasible (WGFD 1994).

At the same time, Wyoming has a fairly flexible stance on dealing with depredating bears. While trap/relocation by the state or Wildlife Services is an option with offending bears, Wyoming statutes allow property owners or lesee to immediately kill any bear doing damage to private property (WGFD 1994). This action by a landowner does not require a bear tag or license. In addition, Wyoming statutes provide monetary compensation for damage to livestock caused by black bears (WGFD 1994).

LIVESTOCK DEPREDATION Mike Bodenchuk

Livestock depredation by black bears can be locally severe. Most depredations are upon domestic sheep, but increasing depredations on calves has been noted in the past several years. Management of depredations is an important component of bear management. Unlike cougar depredations, bear depredations are seasonal in nature due to the limited amount of time domestic livestock spend in bear habitat.

Currently, under Wildlife Board policy, livestock producers may remove a bear which "is harassing, chasing, disturbing, harming, attacking or killing livestock , or has committed such an act in the past 72 hours (Utah Admin. Code R657-33). Livestock producers are required to notify the Division after taking such an action. If they desire, they can purchase a depredation permit for $25 and keep one pelt each year. In the past 5 years, about 10 bears have been taken under this clause. Because bear depredations often occur at night, few livestock producers have the opportunity to remove the offending bears themselves.

Livestock producers may also contact USDA-Wildlife Services for assistance in resolving depredation problems, and most instances are handled in this manner. Unlike the authority granted to producers, Wildlife Services may only remove a bear after confirming that livestock were killed by a bear and not for livestock "harassment". After receiving notification from the livestock producer, reported kills are investigated by a Wildlife Services Specialist. Kills that are "confirmed" as bear depredation, based on forensic evidence of the carcass and site, are eligible for partial compensation. If, in the determination of the Specialist, the bear presents a continued depredation threat, lethal control may be initiated. An average of 13.8 bears per year have been taken from 1972 through 1999 (Figure 3). This number has ranged from 0 in 1974 to 39 in 1998. The short term average from 1994 through 1999 is 27, ranging from 18 to 39. The average number of verified instances of bear depredation from 1994 through 1999 was 137 and ranged from 110 in 1994 and 1995 to 172 in 1998 (Table 3.) The number of livestock confirmed as killed by bears from 1994 through 1999 averaged 349 and ranged from 268 in 1996 to 650 in 1998. The value of livestock confirmed as killed by bears (as reported to Wildlife Services) from 1994 through 1999 averaged $41,850 and ranged

from $25,390 in 1995 to $58,920 in 1997. Approximately 95-97% of livestock killed by bear are domestic sheep, with a few calves and/or goats killed each year. The number of bear damage complaints and bears killed on depredation has generally increased from 1994 through 1998 with a decrease in 1999 (Table 3).

If a depredating black bear continues to pose a threat to livestock, it may be removed by Wildlife Services. Bears may be removed by either a snare set on the livestock kill, so as to catch the offending bear when it returns to the kill, or by the use of hounds trailing the bear away from the kill site. Table 4 shows the method of take percentage for depredating bears from 1994 through 1999. Occasionally, when bears are removed by neck snares or are killed by sheep herders in foot snares, the carcass of the bear is decomposed to the point where determination of sex is difficult for the field specialist.

Table 3. Occurrences and number of confirmed livestock depredation and black bear take by Wildlife Services, 1994-1999.

Year	Occurrence of predation	Livestock Killed	Bear Take
1994	110	306	18
1995	110	291	31
1996	136	268	32
1997	157	487	31
1998	172	650	39
1999	135	400	31

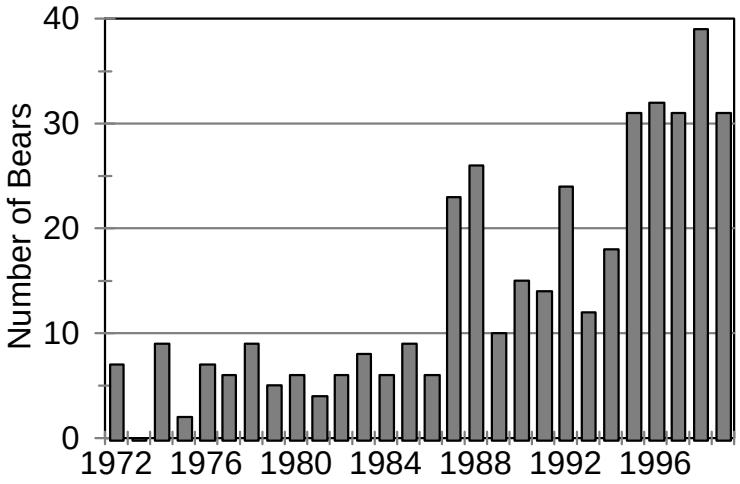
For the bears of known sex removed by Wildlife Services from 1994 through 1999, depredating bears were predominately male (average for the 6 years was 77% male and 23% female). The range of sex ratios (% male:%female) for the five years was from 59%:41% in 1995 to 84%:16% in 1997.

Table 4. Percent take, by method, for Wildlife Services removed black bears, 1994-99.

	1994	1995	1996	1997	1998	1999
Snare	69%	82%	69%	50%	76%	76%
Dogs	31%	18%	23%	50%	24%	24%

Confirmed livestock kills for sheep, cattle, goats and turkeys are eligible for partial compensation. To be eligible, kills must be investigated by either a Division employee or Wildlife Services Specialist and the operator must have paid his livestock assessment (head tax) for the current and previous year. From 1992-1997, the depredation fund for losses to cougar and black bear paid up to 50% of the value of confirmed kills, up to a cap of $50,000. This was paid from license revenues received

Figure 3. Bears taken by Wildlife Services in Utah, 1972-99.



by the Division. The 1998 Utah State Legislature provided a supplement of an additional $50,000 from the General Fund, which allowed full compensation, up to a cap of $100,000. The value of verified livestock losses due to bears averaged $44,939 from 1993 through 1999, ranging from $19,173 in 1993 to $81,740 in 1999. The amount of verified kills exceeded the cap from 1995 through 1999. Producers received 36% of the value of livestock lost in 1995, 47% in 1996, 30% in 1997, 60% in 1998 (with the higher cap of $100,000) and 57% in 1999 (again with the higher cap) (Bates 1999).

Many livestock producers believe that only a portion of their losses are ever located. Black bears often eat an entire lamb in a single feeding, and if the offal or hide is not found the next day scavengers will remove any evidence of the kill quickly. Because livestock are in bear habitat only during the summer, forensic evidence is quickly deteriorated by decomposition. Often, Wildlife Services Specialists cannot confirm a kill due to decomposition. In 1999, livestock producers reported an additional 68 instances of bear depredations which Wildlife Services could not confirm. These unconfirmed losses included 11 calves, 294 adult sheep and 319 lambs valued at $65,030.

Although lethal control for black bear livestock depredation is only initiated on a “corrective” basis (that is, after livestock depredations have been confirmed), and targeted to an offending individual bear, it should be noted that lethal control is still a preventive measure. It is not the intention of UDWR or Wildlife Services to “punish” a bear for depredations, but rather to prevent future depredations by the same individual. The fact that the bear has initiated depredations on livestock is considered an indicator that it may well depredate again. If the bear remains in the area with livestock, and returns to the kill or to the herd, it may be assumed that it will depredate again and lethal control may be initiated, unless livestock will be removed from the area. There is come concern that the carcasses of bears left in the field may attract non-depredating bears to the kill site and near sheep, possibly increasing the take of non-target bears.

Lethal control methods are targeted at the offending individual bear, and therefore a very specific strategy must be employed. Foot or neck snares may be used at the site

of the kill to capture the offending bear when it returns to the kill. These snares are set within a “bear pen”, a constructed “cubby” which covers the kills from all angles except over or through the snare. The cubby, along with pan tension on the foot snare or the size of the loop on the neck snare, serves to reduce non-target risks. Snares set the morning after the kill have the best ability to target the offending bear. Because of decomposition of the kill, snares become less useful daily. Snares are not practical where guard dogs are used with the herd (the dogs will feed on the kill and disturb the set) nor are they practical in areas with high back-country recreation use. In chronic depredation situations, some bears become shy of the cubby set and fail to return to a kill that has been disturbed. In these cases, setting snares may increase depredations, because the bear will ignore the past kill and return to the flock for a fresh kill. A properly set neck snare will kill the bear quickly. Foot snares, however must be checked regularly, increasing the work load of the specialist. Electronic snare monitoring equipment has been employed in some situations to allow remote monitoring of snares.

Hounds may also be used to remove offending bears and are particularly useful in long term depredations or when a Specialist happens on a fresh kill. Hounds are used to trail the bear away from the kill site or the herd. Hounds will bring a bear to bay or tree and the bear is shot. Hound hunting, particularly in the heat of the summer, can be difficult and poses some danger to both the hounds and the Specialist. Hounds are used when other methods are impractical or when the offending bear stays close to the herd. Shooting of an offending bear is a seldom used option, but may prove the most effective in human safety complaints, some nuisance complaints or may be used by sheep herders if they chance to catch the bear killing or feeding on a kill. No toxicants exist for bears, and none are being developed nor are anticipated. Foot-hold traps are not used for bear.

BEAR AND HUMAN INTERACTIONS — Colleen Madrid

Black bears are powerful mammals that have few naturally occurring enemies. Despite this they are remarkably tolerant of humans. Interactions between people and bears are usually benign (Kolenosky and Strathearn, 1987). Most bears, except those that have learned to associate people with food, will generally try to avoid people. In fact, bears will alter their behavior to avoid people. In Yosemite National Park bears have developed a nocturnal habit to avoid contact with people. However, in remote areas, where people are rare, they remain diurnal in their habits. Hastings et al., (1981) studied the reactions of bears and humans in Yosemite and determined that bears were most likely to react in a neutral fashion when encountering people. Less than 2% of bears responded in an aggressive manner. Aggressive behavior was correlated with the month of June, younger visitors and close distances between bears and people.

Although black bears are generally non-aggressive towards humans, attacks resulting in injury and in some cases death do occur. Unprovoked, predatory attacks by black

bears are rare, but highly publicized and have accounted for 23 deaths in North America this century (Herrera, 1985 and Rogers, 1999) Predatory attacks are usually done without warning. A review of the literature shows that in all cases of black bear attacks, fighting back will result in the bear withdrawing from the attack. A person is 180 times more likely to be killed by a bee than a bear and 160,000 times more likely to be killed in a traffic accident (Rogers 1999). A National Park Service report from 17 national parks for the years 1969 through 1978 (excluding 1971) showed that black bears caused 88% of the 299 bear caused injuries to humans (McCollough 1982). In Yellowstone National Park black bear injuries numbered 1,927 while grizzlies accounted for 75 injuries between 1930 and 1978 when black bears outnumbered grizzlies by only about 2:1. Although black bears caused a much higher proportion of the injuries, those inflicted by grizzlies were more serious. Only one mortality had been attributed to a black bear in those years. Gunther and Hoekstra (1996) document dramatic declines in bear related injuries between the years 1970 and 1994 in Yellowstone due to management actions and public education.

Black bear interaction with humans increase when natural foods are unavailable as in drought years, years of late green up and years of berry and nut failures. Many attacks are by bears in poor condition and with little body fat. Under these circumstances, bears are extremely motivated to obtain food and may overcome their fear of humans to get it. According to McCullough (1982) bears that obtain human food are positively conditioned by the food reward. Even if the food reward is removed, loss of the conditioned behavior will be slow, and infrequent rewards will perpetuate the behavior. Habituation may also occur in the absence of food if the natural use pattern of bears brings them into frequent contact with humans. In the absence of punishment the bear becomes habituated to the human, and its declining perception of risk leads to a greater frequency of obtaining the reward and becomes a self-reinforcing process.

Bears also learn from the experiences of other bears. Young bears most often learn from their mothers, but learning can occur from any association among bears. In 1999, a drought year in the southwest, several incidents involving bears and humans were cited in the newspapers. Wildfires forced bears out of their home ranges and into those of other bears where competition over resources increased. An increase in bear sightings in urban areas occurred. Juveniles, who often are looking for their own territories, came into contact with humans. In one instance, campers piled trash in a Forest Service campground instead of packing it home and a juvenile black bear was attracted to the scent. It became habituated to humans and began stealing lunches from campers. Arizona Game and Fish personnel were forced to put the bear down.

In years when weather conditions result in food shortages, bears may be attracted to anything they consider a food source. People traveling in the backcountry should take precautions to prevent bears from obtaining human and livestock food. Hunters should be aware of the potential threat of bears when cleaning and dressing a carcass. People living in rural environments may find bears attracted to livestock, apiaries, fruit orchards, garbage cans, dumps, compost piles and vegetable gardens. In an incident

cited by the Colorado Division of Wildlife, a Boulder resident was awakened to find a bear lodged in his car. Fast food wrappers on the floor of the car attracted the bear. Another bear broke into a car twice before the owner realized that it was attracted to the vanilla scented air freshener. According to Herrero (1985), the most important sense for a bear is that of smell. Bears find their food and mates through the sense of smell. When a bear encounters a person, it may stand on its hind legs to better smell, see or hear a person. It may also charge or partially circle a person to attain a better position where it can catch a person's scent.

The increase in the number of people recreating in the backcountry has increased the opportunity for bear and human interactions. Of injuries documented in the backcountry of Yellowstone, 68% involved females with cubs. Thirty out of 31 involved surprise encounters with bears, and two of these involved people injured when hiking off-trail who surprised bears on carcasses. Of the thirty-one people injured only four were making any effort to make noise while they hiked (Gunther and Hoekstra, 1996). Although the majority of people injured in bear attacks are men, there was speculation that women were attacked because bears were attracted to them during their menstrual cycle. In research studies of grizzlies, polar bears and black bears it was found that menstrual odors were essentially ignored by black bears of all sex and age classes. In addition, in a review of black bear attacks across America, Gunther and Hoekstra (1996) found there were no instances of black bears attacking or being attracted to menstruating women.

Bear attacks in campgrounds and along roads appeared to occur when humans got too close to the bear. Hastings, et al. (1981) documented that the reduction of distance between humans and black bears correlated with increased bear aggression. Bears can be driven away from campsites without incident by making noise and allowing the bear an escape route. Rodgers (1999) maintains that people should approach bears no closer than 15 feet, while Hastings, et al., (1981) cites the distance as 17 feet. Unprovoked attacks occurred while people were sleeping either in or out of tents, but adjacent to improperly stored food. In an attack of a 14-year-old boy scout in the summer of 1999, candy bar wrappers were found in the tent where the boy was sleeping. Once a bear has obtained food it will be more difficult to drive it from the campsite (Herrera, 1985 and Gunther and Hoekstra, 1996).

NON-LETHAL ALTERNATIVES FOR MANAGING PROBLEM BEARS

Allison Jones

There are a number of non-lethal options currently available for controlling problem black bears. Some of these techniques have been used in Utah, while others remain to be tried. Other non-lethal techniques have not been extensively tested. The impetus for expanded research by UDWR on this topic stems chiefly from Utah citizen disapproval of some black bear control techniques (Krannich 1999).

The following section will consider non-lethal methods that focus on controlling nuisance bears in 1) campgrounds, 2) apiaries, and in 3) livestock depredation situations. At the end of the section, general methods that can be used to deter or control black bears in any of the above situations will be similarly discussed.

Bears in Campgrounds

Prevention is the best option for deterring black bears from campgrounds and public education is likely to be the most effective method to accomplish this. However, this analysis focuses primarily on methods to be used with known problem bears, or known problem areas.

Once it has been established that there is a problem bear in or near a campground, a number of non-lethal methods have traditionally been employed to deter or otherwise control the bear. At this stage, use of bear-proof garbage cans and public education within the facility are usually increased. But if these responses are ineffective, there are other options that have proven to be effective, other than destruction of the bear.

One method widely used in campgrounds after initial preventative methods fail is to trap and relocate the bear. Because this method is also an option for many other nuisance situations, it will be discussed later.

A nuisance-bear deterrent that has been used with success in Yosemite is to place balloons filled with ammonium hydroxide in backpacks and stuff sacks within campgrounds (Hastings et al. 1981). This method led to significantly decreased bear activity at campsites. Another non-lethal method that has seen limited use in campgrounds is taste-aversion conditioning. Though this particular solution is more often used with apiary-raiding bears, it has been tried in a campground in Madera Canyon, AZ. In this case, trash cans were baited with honey that was laced with hot peppers (Sorenson 1995). After this treatment was applied, the nuisance black bear never returned.

A fairly new method that has been used in problem campgrounds involves special Karelian bear dogs. These dogs are natives of Finland and Russia, and have been bred so that they are excellent bear trackers (NPS 1998). They don't tree bears like American hunt hounds do; instead they move in quickly and nip the bear before darting away (Twyman 1999). According to Park rangers, the Karelians' loud bark affects bears like no other dog variety can (NPS 1998). A team of specialists will work with a Karelian and a nuisance bear, in combination with other aversive conditioning tools such as pepper spray, rubber bullets and firecracker shells (Nickell 1998). The idea is to teach problem bears near campgrounds to behave in a manner that does not put them in conflict with humans anymore.

Karelian bear dogs have been used with considerable success in some western states. In Glacier National Park, Karelian bear dog teams were effective in training 34 black

bears to avoid camps, park buildings, and other high human-use zones (NPS 1998). Thirteen of these problem bears were habituated to roadsides where they frequently approached vehicles. After Karelian training, all 13 bears learned to leave the roadside when approached by vehicles, yet remained in the areas and used roadsides when people weren't around (Hunt 1999). In Yosemite National Park, the Karelian method proved to be the only feasible alternative for problem bears aside from relocation or destruction (NPS 1998). After treatment, bear incidents in Tuolumne Meadows (Yosemite) were the lowest in 40 years.

While Karelian bear dog teams have had considerable success with problem bears in campground situations, their chief drawback is expense. The services of a Karelian team can cost up to $10,000 a month, and they will usually only focus on one problem area (i.e. campground or park facility/complex) at a time.

Bears in Apiaries

Black bears may cause extensive damage to apiaries. Once a bear identifies an available hive, it will tend to use the same path to return every night until all of the honey, comb and brood are eaten (Hygenstrom 1994). Described below are some of the non-lethal methods currently in use to deter black bears from these activities.

Electronic fencing is a generally effective technique for protecting apiaries (Hygenstrom 1994, Meadows et al. 1998, but see Dorrance and Roy 1975); in some studies demonstrating to be up to 70% effective in foiling nuisance bears (Brady and Maehr 1982). It is recommended that 110 volt, solar-charged fences be used (Meadows et al. 1998), which can either be welded-wire permanent fences, or portable and/or temporary fences (Hygenstrom 1994). Some of the temporary fence models include those that use high-tensile wire, electroplastic netting, electrified twine, or hot tape. The costs of constructing these temporary fences will run anywhere from $200 to $750, and can hold up to 32 colonies of bees (Meadows et al. 1998).

Another deterrence method used by beekeepers is bee platforms. These typically are between eight and fifteen feet off the ground, with a 2-foot overhang around the edges of the platform, and held up by sturdy poles wrapped in sheet metal (Hygenstrom 1994, Meadows et al. 1998). These platforms have proven to be effective at eliminating bear damage, but are generally impractical because they can be expensive to build, are relatively immobile, and present difficulties when bee keepers are working with colonies (Meadows et al. 1998).

The majority of experimental studies documenting the efficacy of deterring methods for apiary-raiding bears have looked at aversive taste conditioning, usually with Lithium Chloride (LiCl). Some studies appear to give clear documentation of black bear aversion to LiCl-laced bait, although this aversion does not last for more than 220 days (e.g. Colvin 1976). Other studies give unclear or mixed results (Gilbert and Roy 1975, Gustavson et al. 1976), or even had negative results (Dorrance and Roy 1975).

Because of these discrepancies in the literature, and because some studies focus on bear feeding aversion as opposed to bear damage aversion, the use of LiCl as an effective aversive conditioning technique is still considered largely experimental. One finding, however, is that LiCl appears to be effective when combined with other techniques such as electric fencing (Gilbert and Roy 1975).

Nuisance Bears and Livestock

As outlined elsewhere in this document, black bears in Utah can be a considerable threat to domestic sheep. There are a number of non-lethal methods used by Utah sheep growers to deter bears from taking lambs and sheep. These methods include fencing, night penning, avoiding known bear depredation areas, disposing of carcasses to avoid attracting predators, providing protected birthing areas, using herders, changing bedding grounds regularly, culling sick and weak animals from the flock, using guard animals, and using fright tactics such as lights and loud noises (Wildlife Services files, 1994 and 1998). In 1994, between 87% and 93% of sheep producers in Utah used a combination of five or more of these non-lethal deterrence methods, at a cost of $674,927.00 (Wildlife Services files, 1994). Still, 955 sheep and 1,472 lambs were taken by bears in Utah in 1998 (Wildlife Services files, 1998).

One possible method to reduce bear depredations is the use of guard dogs (Laycock 1987). "Proven" breeds include Komondor, Great Pyrenees, Shar Planninetz, Italian Maremma, Anatolian shepherd, Castro Labareiro, Kuvasz, and Tibetan Mastiff (Sibbison 1984, OSUES 1985). For centuries, these breeds have been the method of choice for guarding flocks from bears and other predators in southern Europe and Eurasia (OSUES 1985). In all cases, it is essential that these European guard dogs be raised with the sheep from the time they are pups, so they can fully imprint on the flock. This will teach the guard dogs to guard the sheep as if they were its own "territory" (Sibbison 1984). Thus, these European breeds function as true guards, without the need for human interactions...unlike herding dogs which have to be trained to respond to human commands. In field tests with some of these breeds in the U.S., 65% to 75% of dogs worked to the satisfaction of cooperating sheep producers (OSUES 1985). There are also indications that mixed guard breeds can be effective; Navajo Indians have found that mixed breed dogs are useful in protecting livestock (Black and Green 1985). Although guard dogs can help deter livestock depredation by wildlife, they have not eliminated it. Guard dogs also have some negative impacts, including depredation on mule deer fawns by the dogs themselves.

Taste aversion with Lithium Chloride (LiCl) has been unsuccessful in deterring predation by coyotes. However, as predation by bears appears to be food driven (rather that a predatory instinct), it is possible that LiCl may serve as an aversive conditioner for bear predation (Gustavson 1974). Research could be initiated in Utah to ascertain the effectiveness of this technique (Mike Bodenchuk, pers. comm.).

Another method that has been tested to avoid sheep-bear conflicts is the use of pre-

emptive bear relocations. In an experiment on National Forest lands in Oregon in 1990 and 1991, bears with a high likelihood for sheep depredation were trapped and relocated before they had the opportunity to kill sheep (Armistead et al. 1994). The bears that were targeted included 4-year and older bears in the study area who: 1) were the dominant bear within their ranges, 2) were found in areas where depredation was known to occur, and 3) were found frequenting areas with sheep bands. During the grazing season prior to the study, 44 sheep were killed by bears in the study area, and 5 depredating bears were taken by Wildlife Services. In the following (1990) grazing season, 16 bears in the study area were relocated and the subsequent year, only 16 sheep were taken by bears. None of the relocated bears that were collared for observation were involved in livestock depredations (Armistead et al. 1994).

The Oregon study determined that the costs of preventative relocation were about equal to the costs of killing depredating bears. However, it is difficult to justify spending that much money on bears that haven't depredated. Another potential drawback of pre-emptive relocation is that the sites where bear are trapped out of generally need to be accessible by vehicle. This is not always the case in situations where sheep and bear may potentially interact. Even with these potential drawbacks, those involved with this study point to the benefits of this new non-lethal control method. The process tends to result in improved recognition of bear damage patterns which enhances managers' abilities to predict when and where livestock are most vulnerable to predation. This method was also deemed more acceptable to the general public than killing of problem bears (Armistead et al. 1994). Furthermore, ranchers preferred a preventative relocation to the traditional alternative of waiting for bears to attack livestock and then removing the bear. In general, all representatives of cooperating agencies on this project were pleased with the development of a new, non-lethal management strategy.

Non-lethal Methods To Alleviate Potential Conflicts

Translocation: Translocation of problem bears is one of the most widely used non-lethal methods in the west. Though used by many state fish and game agencies, the efficacy of this method is still debated. A literature review and subsequent analysis of a collection of data on 179 trapped and removed black bears reveals informative patterns (Rogers 1986). This study includes summarized data on black bear 2 years and older, from 11 different states. Data for bears with unknown fates were excluded from the analysis. The results indicated that 81% of bears relocated 65 km away or less returned, as did 48% of those relocated between 65 and 120 km away, and 33% of those relocated between 120 and 220 km away. Only 20% of bears returned if they were located 200 km away or more. Overall, 54% of males and 70% of females returned. Also, translocation did not tend to greatly increase mortality of bears 2 years old or greater, but if a female with cubs was relocated, the majority of cubs were lost. The study also postulated that while translocated bears could theoretically adversely affect resident bears in release areas, relocated bears usually move on after being deposited in the new area, and would not tend to have much more effect on residents than do dispersing bears or bears foraging outside their normal ranges. A separate

study that tracked the fates of 99 translocated bears in the southeast reported that only 3% of those bears were involved in further nuisance activity after translocation (Fies et al. 1986). The study also demonstrated that returns by black bears may be further reduced if bears are translocated across a physiographic barrier. However, other studies have shown that translocation is not always effective; an Arkansas tracking study of translocated nuisance bears found that 3 out of 4 relocated bears (moved >100 km from capture site) caused further nuisance problems (Shull 1990).

Supplemental feeding: This approach has been primarily used experimentally with problem bears, usually in tree farms or heavily managed forests. In the Northwest, many bears just out of hibernation (especially females with cubs) are known to scrape sap-rich cambium from trees, until the time when other natural food sources become available (Wray 1987). Recently in Washington and Oregon, supplemental feeding trials were used in an attempt to reduce damage to commercial timber such as Douglas fir, hemlock, spruce and cedar (Bashin 1989). The first bear feeders, filled with special "bear pellets,"were installed in the study area in 1985 (Ziegltrum and Nolte 1997). The Washington study showed that after two seasons of running the feed stations during the critical spring months, damage levels for trees were reduced by 80-100% of what they were before feeding trials began (Flowers 1986). All in all, Washington state credits this program with reducing its bear kill numbers to post-war lows (Bashin 1989). Costs of this supplemental feeding program averaged $2.50 a day per feeding station, or $40 per spring per feeding station (Bashin 1989). It is likely that supplemental feeding programs such as those of Oregon and Washington could be used elsewhere to reduce bear damage to livestock, apiaries and other valuable crops. However, evidence suggests that the success of a feeding program declines as bear densities increase and there is increased competition for food (Ziegltrum and Nolte 1997). Since supplemental feeding may lead to increased bear densities, this may be one drawback of a feeding program.

Bear "Rehabilitation" and Aversive Conditioning: Active rehabilitation of problem bears is a feasible alternative to traditional methods such as translocation or taste aversion. One on-site rehabilitation method that has met with considerable success is trap and release in the problem area. There are limited instances where this method has been scientifically tested. A 1988 study found that out of 63 black bears trapped in a bee yard and subsequently released in the same yard, only 14% caused additional apiary damage (Wooding et al. 1988). A similar study conducted in 1982 found that only one bear out of nine trapped and released in apiaries returned to the bee yard during the study period (Brady and Maehr 1982). A study in Arkansas reported that out of 15 problem bears captured and released on site, only three were recaptured after causing further nuisance problems and then relocated >100 km from the capture site (Shull 1990). There is also one Karelian bear dog team in the western U.S. that has started to use on-site trap and release as part of their bear rehabilitation program, with positive results (Nickell 1998).

Another successful example of on-site aversive conditioning of black bear was

illustrated in a (Green) 1982 study, in which a problem black bear was caught in a culvert trap and classically conditioned using ultrasonic sound. In a post-release trial, the bear was successfully repelled when ultrasonic sound was presented. Some of the most intense on-site field experimentation with non-lethal aversive conditioning techniques have been carried out by Hunt (1984) with black bears in Montana. Her findings revealed that aversive conditioning treatments using a combination of full-strength Parson's ammonia and human urine were about 70% effective in deterring bears. This may have some usefulness in deterring bears from raiding garbage cans, or entering structures, but its applicability in deterring livestock depredation in open areas is limited.

Yet another tactic used to rehabilitate problem bears actually occurs away from the problem area. One rehabilitation facility established in Montana will take problem bears (both grizzly and black bear) and put them into a special facility where the bear spends most of its time in a dark, quiet residence where it is never bothered. When the bear comes out for any reason, it is given the opportunity to interact with a person. If it doesn't run back to its refuge, it is sprayed with repellants or treated with one of several other techniques that further reinforce its aversion to humans (Laycock 1987). Chuck Jonkel, founder of the Montana facility, reports only one "back-slider" out of all the bears treated at the facility. A similar center, called HOWL, has recently been established in Washington state. Their success rates with rehabilitation of problem bears similarly appears to be high (Wasserman 1996). However, an obvious drawback of this kind of rehabilitation is expense.

In general, it appears that on-the-ground (on-site) bear rehabilitation attempts may hold the most promise of all techniques, lethal or non-lethal, available to managers who must deal with problem black bears. Removing the problem bear, whether through lethal means or translocation, does not always remove the problem itself. The open territory that was vacated will soon be filled by a bear who may become a nuisance, as a result of whatever attractant still exists in the area. Development of non-lethal methods that prevent conflict with bears is desirable. It is important that these types of solutions are thoroughly tested and implemented, especially in a state with a fast-growing human population such as Utah.

BLACK BEAR MANAGEMENT METHODS — Rick Danvir

Black bear management methods and strategies encompass management of bear habitat, open space, hunting, nuisance and depredating bears. The range of strategies and methods used in managing black bears include the following:

Minimal Action - Allow bear population to exist and fluctuate as dictated by weather and available habitat. In practice, this is the no hunting option, common to National Parks. Since some safety and economic impacts exist, management of problem bears by UDWR, Wildlife Services, or some other entity is demanded by the public. However,

non-lethal management of problem bears is preferred to lethal methods.

Monitor and Manage Habitat - Maintain and manipulate bear habitat to achieve a defined set of goals. This entails no hunting and minimal use of lethal management options. UDWR's role would be one of providing information regarding important habitats and habitat management strategies to land managers, and coordinating with Wildlife Services regarding nuisance and depredation issues.

Monitor and Manage Populations - Monitor and manage bear populations consistent with a defined set of goals. This option allows recreational hunting as a tool, or goal, as well as other lethal and non-lethal methods. This method does not consider habitat issues.

Monitor and Manage Habitat and Populations - Monitor and manage habitat and populations consistent with a defined set of goals. This method allows managers to utilize the broadest array of methods and strategies.

Currently, Utah uses a version of the **"**monitor and manage habitat and populations**"** option. However, depending on the status of bear populations within particular management units, the other three options are applied locally.

The socio-ethical and economic aspects of lethal and non-lethal methods of dealing with nuisance and depredating bears are covered in other sections. Habitat issues and management are similarly dealt with in the habitat section. This section will focus on the application of bear hunting strategies to achieve population management goals.

Hunting strategies are designed and implemented to achieve some combination of the following goals: 1) provide recreational hunting opportunity; 2) maintain populations at a prescribed level; and, 3) address nuisance or depredation problems. Hunting strategies can be designed to allow populations to increase, or decrease, while still maintaining some level of sport harvest.

Hunting strategies involve manipulating unit boundaries, season length, opening and closing dates, bag limits, hunting methods (i.e. incidental, still hunting, baiting, hounding), weapon restrictions, permit requirements, and access management. Options range from no hunting to year-long hunting with no bag limit or method restrictions.

Harvest Level - Estimates of population reproductive performance, survival rates and numbers or density are important factors to consider when determining appropriate harvest levels to achieve population goals. Unlike coyotes, compensatory increases in cub production due to harvest have not been demonstrated in bear populations (Miller 1990). In fact, heavy harvest levels which significantly lower the mean age of breeding females can lower the reproductive rate and cause population decline. Most published criteria for determining allowable harvest levels are aimed at maintaining a relatively

constant population size. Bunnell and Tait (1981) estimated allowable harvest rates in bear populations when provided information on age at first breeding, average natality rate, and population density. Bear density estimates are generally developed by extrapolating data from mark-recapture studies to areas with similar habitat. Utah has implemented a strategy similar to surrounding western states (Idaho, Colorado, Arizona, Wyoming) and has estimated bear densities and habitat use in several areas. Other population indices that have been tried experimentally include bait-station visits (Idaho), track surveys (Utah), and remote camera recapture (Colorado) (Auger and Black 1995).

Highest sustainable harvest levels occur when hunting seasons are designed to harvest males and protect adult females (Bunnell and Tait 1981, Beck 1991, Beecham and Rohlman 1994). Nearly all western state wildlife management agencies now monitor sex and age ratios of harvested bears. Harvest strategies are designed to sustain populations by keeping the proportion of females in the harvest less than 40% (Auger and Black 1995). Idaho's Black Bear Management Plan (IGFD 1998) describes application of this technique. Harvest age and sex ratios were correlated with research studies (Beecham and Rohlman 1994). They found lightly hunted populations generally had ratios of 70 adults:30 sub-adult bears, with 35% of males being adults and a median population age for both sexes of 7.5 years. Heavily hunted populations exhibited ratios of 40 adults:60 sub-adults, with only 21% of males being adults and a median age of 2.5 to 3.5 years. Similar age and sex structure to the Idaho study was observed in lightly hunted populations in Alaska, Virginia and Arizona. The similarity between live trapping and harvest age and sex ratios led Idaho researchers to conclude that harvest data accurately represented actual bear population demographics.

Idaho used this information to develop guidelines to estimate harvest intensity (IGFD 1998). Management units characterized by harvests having <30% females, > 35% adult males (over 4 years old) and increasing bait station survey visits were considered lightly harvested. Units where the harvest was 30-40% females, 25-35% adult males and stable bait station attendance were considered moderately harvested. Units with >40% females, <25% adult males and decreasing bait station visits were considered heavily harvested. These criteria were applied to units in which at least 30 bears were killed annually. Managers are also to consider that hunted areas adjacent to lightly hunted 'reservoir' areas may be harvesting large numbers of dispersing sub-adult bears from the adjoining unit, thus increasing the percent of sub-adult males in the harvest.

Other states use similar criteria. Beck (1991) recommended harvesting 1 adult female per 77 mi^2, maintaining the proportion of females in the annual hunter kill at less than 40%, and the proportion of adults in the annual female bear kill greater than 65% in Colorado. As of 1995, Arizona's objectives included maintaining females at less than 30% in the harvest. They use female quotas in some units. California aimed for a median age of 4.5 years in harvested females and closed the statewide hunt when 1250 bears were killed (Auger and Black 1995).

Unit Boundaries - Hunting strategies may vary among management units, depending on characteristics of local populations relative to management goals. Units, or sub-units characterized by consistently high reproductive rates, or experiencing high depredation kills may require different management strategies than those with few problems or few bears. While hunting distribution may need to be concentrated in sub-units to achieve specific goals, it may be possible in some cases to combine harvest data from several adjoining units to provide meaningful sample sizes.

Hunting Season Length - Season length is not always positively correlated with kill rate. Lengthening seasons increases kill only as long as hunter effort also increases. Nearly 1000 bears have been killed in one-day hunts in Pennsylvania (no dogs, no bait). Season length seems to have more influence on the sex composition of the harvest than on harvest rate in Idaho (Beecham and Rohlman 1994). Season length may negatively influence survival, if individual bears are repeatedly disturbed, stressed and unable to forage adequately.

Hunting Season Timing - Given knowledge of age and sex specific den entrance and emergence chronology, managers may be able to time seasons to affect both the sex and age composition of the harvest, and overall harvest level (Lindzey 1981). Male bears emerge from dens 2 weeks earlier than females in southwestern Colorado. Beck (1991) estimated that a spring hunt ending 1 May would protect nearly all females, a 15 May closing would still find 25% of females in dens, and the remainder relatively inactive and in close proximity to dens. Beecham and Rohlman (1994) reported that early spring hunting in Idaho, before mid-May, did indeed limit the number of females harvested (14% of harvest). However, the proportion of females in the Idaho harvest and the overall number of bears harvested increased substantially by extending the spring season into late May and June. High female and overall harvest rates seem to occur during late May, early June and September hunting seasons in many western states (Auger and Black 1995). Since female bears also generally den before males (Lindzey 1981) late fall hunts can be used to take males with little likelihood of female harvest.

Arizona Game and Fish Department initiated an early spring hunt as an experiment to see if it would effectively reduce the proportion of females in the harvest (John Phelps, personal communication). The season ran from April 1 to April 30, and no hounding or bait was allowed. Over the past 10 years sportsmen took 3 males and 1 female. Biologists felt that the low harvest rate was because the season was too early and male bears, while out of the den, were not yet traveling widely.

Since 1993, Colorado has had a fall season with archery, muzzleloader, and rifle permits in September, and rifle permits in October. Use of hounds or bait is not allowed. The October rifle hunt runs concurrent with big game hunts. A smaller proportion of females are taken in the October hunt, with rates similar to those Colorado had in spring hunts prior to 1994 (Tom Beck, pers. comm.). Overall, since the spring bear hunt, hounding and baiting was eliminated in 1992, the percent of females in the

harvest has increased slightly from 37.4% to 40.5%. The fact that over 47% of the sport harvest was in October may have contributed to a lower proportion of females. The overall average annual harvest has increased from 493 to 507. In 1999, Colorado experienced their highest recorded bear harvest at 839 with spot and stalk as the only hunting method.

Spring Bear Hunting - Reasons cited for offering spring bear seasons include vulnerability of bears due to predictable spring habitat use patterns, preponderance of males in the harvest prior to mid-May, and providing extended hunting opportunities and reducing the number of conflicts between big game and bear hunters in the fall.

The list of reasons to not have a spring bear hunt is actually quite similar to those not to hunt in the spring. Ethical and management reasons are given for not hunting bears when behavior is predictable and they are vulnerable after den emergence. Many feel it unethical to hunt bears in the spring, a time when most game species are raising young. Hunters, non-hunters and managers alike express concerns that hunting and killing nursing sows will cause cub starvation.

Opposition to spring hunting seems focused on fair treatment of individuals as opposed to management of populations. Opponents view spring bear hunting as distastefully as a sportsman might regard hunting elk calves in June to achieve population objectives. Although possibly good for an elk population that exceeds carrying capacity, it is ethically objectionable.

Hunting Methods

Incidental: Incidental take of bears by hunters primarily pursuing big game during regular seasons can increase harvest and affect the proportion of females in the harvest (Wiley 1971, Lindzey and Meslow 1977). Higher hunter density, coupled with persons killing bears incidental to other game results in less selectivity for larger bears. Hunting bears concurrent with big game seasons is allowed in several states, including Pennsylvania and Colorado. In Colorado in 1999, 10,493 big game hunters also purchased a bear permit at $30 each for residents, and $250 each for non-residents. These hunters killed 311 bears, for a success rate of 3% (Tom Beck, pers. comm).

Hound Hunting: Proponents of hound-hunting value the relationship between man and dog, with the excitement of the chase being as important as the potential to harvest an animal. Most houndsmen and some wildlife managers believe the use of dogs can aid in determining age, sex and reproductive status of bears, allowing them to be more selective. Data obtained by houndsmen while pursuing bears is useful in managing cougar and bear (UDWR 1999). Wildlife managers value having access to skilled, ethical houndsmen when they are in need of hound-hunting assistance. Some managers believe hounds and houndsmen may be useful in aversive conditioning tactics with problem bears.

Negative feelings about hound-hunting generally relate to fair chase, the feeling that bears haven't much of a chance to escape hunters on 4-wheelers and dogs with radio-collars. Although many bird species are hunted with dogs, hunting bears with dogs is a concern of the public in Utah (Krannich and Teal 1999). There is concern with both hound-hunting and pursuit only seasons that: 1) cubs are being killed by dogs on the ground; 2) cubs are being separated and orphaned from sows; and 3) pursuit occurs at times when bears are either in declining physical condition (spring) or attempting to gain condition for winter dormancy (fall). Hound-hunting and pursuit of bears during fall deer and elk hunting seasons have resulted in conflicts between bear hunters and deer/elk hunters in Utah. Some wildlife managers have expressed concern about the negative effects on ungulate survival and reproduction during spring pursuit seasons. The lack of hard data suggests there is a need for management oriented research to address these concerns.

Data from Idaho suggests that hunter success with hounds is twice that of hunting with bait, 3 times that of still hunting, and 8 times that of incidental hunters (Beecham and Rohlman 1994). While hound hunters are more successful than other types of hunters, hound hunters do not harvest a bear each time one is treed or cornered. Also, hound hunters do not tree or corner a bear each time they hunt. On average, a bear is treed or cornered about one in three days of hunting with hounds (Bates 2000, Allen 1984, Auger and Black 1985, Higgins and Vaughan 1999).

The ability of houndsmen to selectively harvest male bears is somewhat unclear. While houndsmen feel they can be very selective, some researchers disagree (Auger and Black 1995). Poelker and Hartwell (1973) reported that hound hunting resulted in a greater kill of females than other methods. Bunnell and Tait (1981) hypothesized that females would be more vulnerable to hunters with hounds. However, research in New Hampshire (Livaitis and Kane 1994) and Virginia (Higgins and Vaughan 1999) revealed hound-hunters harvested more males than females. Researchers attributed this to selection by hunters for older males. In contrast, analysis of data in Colorado, Idaho and California suggested hound-hunters were not strongly selecting for males. However, there did appear to be selection for older age bears in Idaho (Auger and Black 1995).

Several experienced Utah houndsmen reported that females with cubs generally tree with their cubs, or put their cubs up a tree and stay on the ground (Auger and Black 1995). While experienced hound-hunters may be able to determine nursing status of treed sows by teat condition, research from Maine indicated females did not tree with their cubs (Allen 1984). Surveys in Virginia suggest that while hound-hunters try to select against females, 40% could not identify the sex of a treed bear (Higgins and Vaughan 1999). Regardless of hunting method, the ability of hunters to select for larger or male bears and avoid killing females appears to be largely dependent on the hunter's desire to be selective and the hunter's experience observing bears.

Baiting: Bait hunters believe that the increased ability to view bears at bait sites allows

them to select for larger male bears and avoid killing females with nursing cubs. This may be particularly true of archers, due to the need to be in close proximity to the bear. Some argue baiting may provide supplemental nutrition at critical times of the year (Auger and Black 1995). Some wildlife and public land managers are concerned that baiting may condition bears to seek out human food sources, such as campgrounds or garbage. Complaints of unsightly conditions of bait stations on public lands have been received by public land mangers.

Idaho data suggests that bait hunters are 1.5 times more successful than still hunters and 4 times more successful than incidental hunters (Beecham and Rohlman 1994). Similar results were recorded in Colorado. Hunting success in the spring, when baiting was allowed, was 31%, as compared to 21% in the fall when neither bait nor hounds were allowed (Auger 1995).

Spot and Stalk (Still Hunting): This type of hunting generally involves sitting and glassing, or moving slowly through likely bear use areas in spring or fall. This is a popular bear hunting method in many western states (Auger and Black 1995). Hunter success is generally lower than with hounds or bait. This method appears to get better fair chase ratings from the public (Auger and Black 1995). Since hunters may be able to observe the bear for some time before taking, there may be an opportunity to avoid killing females with cubs. While hunter success is generally lower than hunting with hounds or bait, harvest rates can be maintained when managing through spot and stalk seasons. Harvest rates in Colorado have remained near average since baiting and hounding were prohibited in 1993 (Tom Beck, pers. comm.). While the total harvest initially declined after eliminating other hunting methods, from 479 in 1992 to 278 in 1993, it has increased. Total harvest was 839 in 1999.

Other Hunting Related Issues

Weapon Type: Weapon selection may influence hunter success depending on hunting method. It probably has little effect when using bait or hounds, but may be reduced for still hunters using archery equipment or muzzleloaders as compared to rifles.

Permit Type: Permit types include unlimited (incidental), limited entry, quota or harvest objective. Incidental permits generally involve allowing big game hunters to purchase a permit while hunting for other species, but some states have unlimited permits for general bear hunting. While incidental hunter success is generally lower than with other hunting methods, high hunter numbers afield can result in large harvests (Beechman and Rohlman 1994). Limited entry permits can be used to control the numbers of bears taken, while at the same time providing a quality hunting experience. Quotas can be used to achieve a predetermined harvest level in a given area. Quotas can also be used to regulate the number of females taken from an area.

Access: In Idaho, Beecham and Rohlman (1994) believed bears to be less vulnerable

in areas of dense, expansive cover with few roads. Heavily roaded areas, with patchy distribution of cover resulted in higher harvest rates, particularly of adult males, who will frequent more open areas when in search of estrous females. Refuges have been established in some southern states to protect bears from harvest. Road closures or lack of roads can similarly reduce harvest by limiting density and mobility of hunters. These areas tend to experience low hunting mortality and provide dispersing sub-adults males to replace bears harvested from more accessible, adjacent areas. Lightly hunted areas, then, can function to buffer adjacent heavily harvested areas. Sub-adult females, however, infrequently disperse into adjacent areas. It is therefore difficult for bears to recolonize after the population has been severely over exploited.

Harvest Level:

Controlling the number of bears harvested is an important management function. The following are ways to accomplish desired harvest:

Strategies to Increase Harvest:

- increase number of hunters
- hunt bears in May and September
- lengthen seasons
- allow use of hounds, bait, still and incidental methods
- allow any weapon
- increase bag limit
- increase non-resident permits
- reduce permit costs

Strategies to Decrease Harvest:

- decrease number of hunters
- hunt prior to mid-May and after September
- shorten or eliminate spring or fall seasons
- limit the use of hounds, bait, and incidental methods
- maximize still hunting opportunities
- maximize primitive weapon opportunities
- implement limited entry, quota, female sub-quota or harvest objective hunting strategy
- decrease non-resident opportunities
- increase permit cost

Designing a harvest strategy to maximize hunter opportunity while restricting harvest of females may involve combining strategies from each of the preceding lists.

SOCIAL ISSUES OF BLACK BEAR HUNTING:
The Non-Consumptive Perspective **Kirk Robinson**

Moral Issues of Black Bear Hunting

People enjoy wildlife in many different ways. Some enjoy observing wild animals, some enjoy learning about them, some enjoy hunting them, and some simply enjoy knowing that they exist. Some people enjoy wildlife in all these ways. There are some people, however, who feel very strongly that it is wrong to hunt animals for mere sport. These people constitute a substantial portion of the public, so it behooves wildlife management professionals to try to understand and respect their point of view.

The terms 'consumptive use' and 'nonconsumptive use' are commonly employed to designate, respectively, hunting and nonlethal forms of wildlife appreciation. Indeed, the very words suggest this distinction. However, this can lead to confusion. For example, a person who shoots a bear with a camera one day and shoots it with a gun the next for the sake of a trophy engages in both kinds of use, yet clearly sees nothing wrong with hunting animals merely for sport. On the other hand, someone who enjoys photographing bears might kill one for food if necessary and still be opposed to hunting for mere sport. Consequently, far from explaining the difference of sentiment that so deeply divides people on hunting issues, this pair of terms tends to obscure it. The distinction of real importance for understanding such controversies is the one that differentiates between people who see nothing wrong with hunting animals for sport and people who do, not the one between hunting wildlife and watching wildlife.

People who believe that it is wrong to hunt and kill animals for mere sport hold this view because they believe that animals possess intrinsic value and not only instrumental value. They believe, in other words, that animals are good in themselves and are not merely interesting to observe or fun to hunt. Granting this premise, it follows that we are morally required to respect the lives of animals--that is, we are required to treat them as beings possessing dignity and worth and not merely as means to our own enjoyment. This is why "nonconsumptive" wildlife users are often so strongly opposed to many traditional "consumptive" wildlife practices, such as sport hunting, hounding of black bear and cougar, bear baiting and trapping.

But do black bears and other animals possess intrinsic value? It will not be denied that the presumed intrinsic value of human beings depends essentially on their intelligence and sentience; and since black bears are also intelligent, sentient beings, reason forces the conclusion that they also possess intrinsic value, though perhaps to a lesser degree. Ergo: we should not dispose of their lives for trivial reasons, e.g. for sport.

Anyone capable of following the above reasoning will see that the moral objection to hunting black bears for mere sport is based on reason, not whimsy or sentiment as hunters so often allege. On the contrary, it is the sport hunter whose hobby lacks a

reasonable justification. Furthermore, it is no good responding to the above reasoning by saying that no one has a right to judge whether it is morally wrong to hunt black bears for mere sport, for this merely begs the question. Imagine someone saying that no one has a right to judge whether it is morally wrong to lynch people without a fair trial. From a logical point of view the two cases are strictly parallel.

But what if it is necessary to “take” black bears? One often hears hunters and wildlife managers claim that it is necessary to “harvest” some black bears. And if so, what is the harm if those bears are taken by the sport hunter who is after a trophy?

The problem with this argument is with the premise “it is necessary to harvest some black bears.” One must ask, why is it necessary to harvest some black bears? It all depends on the goals of wildlife management, and these in turn depend on the values that are entrenched in wildlife management agencies. Once again, the real question is begged and not seriously addressed: What should those values be? This is not to say that there can be no good reason to kill a black bear, only that a general sport hunt cannot be justified just by claiming that it is necessary to “harvest” some bears.

It seems fair to conclude that anyone who thinks that black bears do not possess intrinsic value, or who thinks that the question of the morality of hunting them for sport is a non-issue, simply hasn't thought about the question honestly and hard. Failure to do this might be a product of their uncritical acceptance of the idea that all value is a mere projection onto the facts--in other words, a mere matter of opinion. This is a philosophically naive view that relativizes and thereby undermines all moral values.

Public Opinion

Wildlife managers and members of the Utah Wildlife Board should be aware of public opinion regarding various wildlife management practices and should take these opinions into consideration when producing and approving wildlife management proclamations. For example, recreational hunting as a strategy for managing black bears, as well as the practices of hounding and baiting, receive low approval ratings from many members of society, including many Utahns. According to a 1999 survey commissioned by the Division of Natural Resources (Krannich and Teel 1999), the general population of voting-age Utahns, which includes both the hunting and the non-hunting segments, gives these practices an average rating of 4.0, 2.9 and 2.3 respectively out of 10, where 10 is positive, 5 is neutral and O is negative. These are the lowest approval scores received by any wildlife management practices. Furthermore, while hunters as a group show slightly less disapproval of these practices, here again the averages are quite low: 5.7, 4.6 and 3.7 respectively for recreational hunting, hounding and baiting of bears. Another survey, having a different structure, yielded similar results, showing that three-quarters of adult Utah citizens disapprove of these same practices (Briscoe 1991).

Spring Black Bear Hunting Issues

Spring bear hunting inevitably orphans baby bears, all of which subsequently die either from starvation or predation. Research suggests that there is strong reason to doubt that this unfortunate consequence can be prevented, though it might be reduced to some extent through timing of the hunting season and hunter education.

Spring bear seasons create the perception that wildlife management agencies value game species unequally. Tom Beck stated, "Many wildlife agency personnel have grave concerns regarding impact of spring black bear hunters on ungulate populations. The fact that they appear more worried about incidental impact to other wildlife rather than the target species further agitates the critics of spring bear hunting.... The perception that we hold hunters to one standard with popular game animals (deer, elk, bighorn sheep) but not with bears creates a big credibility problem for agencies. Try suggesting a spring hunt for elk some year. As public agencies, credibility is our main currency for keeping public support" (Beck, et al. 1995).

Spring bear seasons may cause road damage and stream siltation: "In order to bias the kill to males, agencies encourage hunters to hunt as early as possible. This often results in severely rutted access roads. The road condition is a valid concern to land management agencies and private landowners as bad conditions increase maintenance costs. Rutted roads also contribute to increased erosion and silting of streams. This can have a negative effect on stream fisheries, especially in highly erosive soils" (Beck, et al. 1995.).

Some hunters contend that spring hunts are part of their hunting tradition, and so ought to be preserved. To the contrary, it may be argued that the Utah spring bear hunt, having now been discontinued for several years, supports the claim that no spring bear hunt is part of the hunting tradition in Utah. And since only six of twenty-seven states that hunt black bears still hold a spring hunt, spring bear hunts can hardly be described as the predominant hunting tradition throughout the nation. (Only two of these six states also allow the use of hounds and baits in spring.) Furthermore, the fact that a practice is traditional does not by itself argue persuasively for or against continuing the practice. Many traditional practices, such as slavery, have been rightly discontinued, which implies that if the practices of hounding and baiting black bears should be continued, the reason cannot be simply that they are traditional practices.

Many hunters are afraid that if spring hunts are discontinued, other hunting privileges are bound to be discontinued too. They fear a slippery slope of continuing loss of hunting privileges. Does this amount to a good reason for having spring bear hunts, and especially for reinstating spring hunts once they have been discontinued? Partly the answer depends on whether the fear is well-founded. Is the discontinuation of spring bear hunting really likely to lead to the discontinuation of other hunts? What evidence is there that it will?

In truth, there is no evidence that discontinuing spring bear hunting raises the probability that other hunts will be discontinued. Types of hunts, and seasons and methods, have changed over the decades, but no one has ever shown that this change correlates in any way with the presence or absence of spring bear hunts, let alone that the changes are causally related. Furthermore, even if one supposes that citizens who disapprove of spring bear hunting will try to end this and other types of hunts, there is no reason to think that their success in ending one type of hunt will of itself increase their ability to end other ones.

In Utah there is yet another reason for dismissing this concern: the passage of Proposition 5. Proposition 5 and H.B. 34 both became law in 1998. Together they make it virtually impossible for the citizens of Utah to mount a successful ballot initiative affecting wildlife management practices. In order to do so, initiative supporters would first have to get the initiative on the ballot, which requires obtaining signatures from a large number of citizens in at least 20 of the 29 counties as required by H.B. 34; and second, would have to muster at least two-thirds of the vote in favor of the initiative, as required by Proposition 5.

Finally, even if hunters' "slippery slope" worry were well-founded, it does not follow that their concerns possess any more merit than the concerns of other citizens who may disagree with them. Why should their worry that hunting privileges might be taken away be given any more consideration than the worry of other citizens that wild animals are being killed for sheer sport?

Black Bear Hounding

The practice of hounding bears, especially in spring, may have a negative effect on bears and their offspring. Granted, the limited research conducted to date does not confirm this, but neither does it disconfirm it. It may very well be the case that cumulative stress, which has never been an object of study, negatively affects fitness and reproductive success of bears. The mere fact that bears have been hounded repeatedly with no “apparent” harm does not settle this issue.

Hounding of bears also results in occasional conflicts between deer and elk hunters on the one side and bear hunters on the other. Packs of dogs coursing through an area can ruin someone's hunt by scaring the game away. There have been complaints of this nature from Utah hunters.

Black Bear Baiting

Baiting may habituate black bears to human sources of food, which might create a tendency for nuisance behavior. There is not sufficient research to indicate whether or not this hypothesis is true, but it should be reason for concern.

Bear baiting does not give the quarry a sporting chance. No one will deny that it may require great patience on the part of the hunter to stay put long enough for a bear to come to the bait, and perhaps skill with a weapon as well, but it makes sitting ducks of bears. To some, it does not appear to be fair chase.

Lactating females who come to baits may not take their cubs with them. Instead, researchers report that they usually put the cubs up a tree several hundred yards away from the bait. In the absence of accompanying cubs, it may be difficult for the hunter to accurately discriminate between these bears and others, since the angle of observation, the distance, and the lighting conditions will typically be sub-optimal. In addition, the nipples of lactating bears may not be visibly distended if she is nursing frequently (the usual case), making it even more difficult for the hunter to discriminate between them and other bears. As a consequence of these factors, lactating females are apt to be killed and their cubs orphaned, which cubs will inevitably die.

SOCIAL CONSIDERATIONS - The Sportsman's Perspective **Don Peay**

One of the core founding principles of the United States of America are the freedoms and rights of the individual. Even though the majority may disagree with many issues or actions, these actions of a minority are still permitted, even actions that lead to death or injury, or loss of property of other individuals.

As an example, alcohol consumption in moderation causes no harm to other individuals. However, because alcohol is available, some abuse it, and literally hundreds of thousands of Americans have been killed, maimed, or injured. Tens of millions of dollars of property loss are incurred. Even so, to protect the rights of individual freedom, even though it is illegal to drive while under the influence of alcohol, alcohol production and consumption is allowed.

Utah citizens are perhaps even more supportive of individual freedoms and rights because of the Mormon culture. Mormons suffered religious persecution from about 1830 to 1846, and were forced out of numerous states. This resulted in a culture that respects the rights of the individual.

Clearly, polling data shows that a majority of Utah citizens do not approve of a number of activities that a minority of Utah citizens participate in; including some that cause the loss of human life and property. However, because of the deeply seated belief in the rights of individuals, minority activities are allowed.

And so it follows with wildlife management. Wildlife populations should be managed to be healthy and perpetual. While the minority opinion may be that wildlife management should be based on public opinion polls, or majority rule, this is clearly contrary to the view of the majority of Utah citizens.

To quote the media, “Proposition 5 was one of the most hotly contested issues of the 1998 election”. Proposition 5, which requires a two-thirds majority vote for any citizen initiative to pass regarding managing wildlife, was debated throughly in the public and media. Based on polling, most people in Utah don’t like the use of hounds to hunt cougar or bear. Every conceivable pro and con argument was aired in TV debates, newspaper editorials, and in voter registration guides. Yet, the vote was overwhelming. Twenty-seven of 29 counties voted for Proposition 5. Therefore, wildlife management will continue to take place under the system that has been used for the last 100 years. Even though hunters are a minority, as long as hunting takes place within sound biological frameworks, hunting should be allowed.

If 40, or 100 bears need to be taken to minimize livestock depredation, or can be taken and still maintain viable and healthy bear populations, then whose right is it to judge which method can be used, or value if a method of harvest is ethical? It is very clear that Americans and Utahns have a very strong belief and legal basis for the rights and freedoms of the individual, even when those rights and freedoms may lead to death of humans, and destruction of personal property.

Standing upon such core beliefs, those who don’t hunt, or disagree with bear hunting should not be allowed to impose their opinions on those who do. If biologists, through the wildlife management process, determine that bears need, or can be taken, wildlife management policies should allow bear hunters to use methods of their choice. Without question, the two methods that allow the most selective harvest of bear are baiting and hounding. Both activities allow hunters to be in close range for an extended period of time before taking or passing on a bear. Anyone who has hunted bear using either method knows that it is a difficult activity and requires a lot of effort and skill to be successful.

BLACK BEAR RECREATION

John Bair, Byron Bateman, Bill Bates

Hunting

Black bear hunting in Utah has occurred for many years but was unregulated until 1967. Since 1969, the number of permits sold has been as low as 43 (1969) and as high as 687 (1989) (Table 5). The lowest number of hunters afield was 31 in 1969, and in 1989 the highest was 556. Success percentage has been as high as 58% (1969) and as low as 6% (1970). The lowest number of bears harvested was 9 in 1970, and the highest 97 in 1989. Since 1969 there has been an average of 209 permits sold, 176 hunters afield, 40 bears harvested and 20% hunter success rate. The long term average of bear per hunter was 0.23. Hunter success varies with the hunting method used, hounding being the most effective followed by baiting and stalking.

A person wishing to hunt bear in Utah must be 12 years of age and obtain a permit through a limited entry permit system. In the past, a hunter needed to obtain a small

game or combination license to hunt bear but on July 1, 1999 the requirement was dropped, so only the habitat authorization and bear permit was all that was required. A hunter may take only one bear during the season and from the limited entry area specified on the permit.

Currently all successful hunters are required to have their bears checked by an officer within 48 hours of harvest. Since 1995, a tooth has collected and used to determine the

Table 5. Summary of Utah black bear harvest statistics, 1967-99.

Year	Permits Sold	Hunters Afield	Sport Harvest	Percent Success	Bear per Hunter	Percent Females	Depredation and other mortality	Total Bear Mortality	Pursuit Permits
1967			15				12	27	
1968			12				9	21	
1969	43	31	25	58%	0.81		27	52	
1970	155	119	9	6%	0.08		18	27	
1971	59	48	17	29%	0.35		16	33	
1972	96	77	19	20%	0.25		7	26	
1973	125	114	25	20%	0.22		0	25	
1974	134	117	29	22%	0.25		9	38	
1975	161	144	22	14%	0.15	41%	2	24	161
1976	107	96	10	9%	0.10	42%	7	17	48
1977	149	127	26	17%	0.20	33%	6	32	77
1978	222	185	40	18%	0.22	33%	10	50	114
1979	240	196	26	11%	0.13	19%	5	31	91
1980	217	177	26	12%	0.15	28%	6	32	95
1981	263	227	39	15%	0.17	30%	4	43	95
1982	229	188	38	17%	0.20	39%	6	44	93
1983	219	176	18	8%	0.10	44%	9	27	98
1984	217	184	26	12%	0.14	31%	6	32	33
1985	269	230	29	11%	0.13	27%	10	39	86
1986	332	302	72	22%	0.24	45%	6	78	90
1987	326	262	44	13%	0.17	35%	25	69	156
1988	491	394	69	14%	0.18	35%	28	97	173
1989	687	556	97	14%	0.17	30%	10	107	187
1990	142	119	22	15%	0.18	18%	16	38	355
1991	142	119	35	25%	0.29	23%	15	50	364
1992	142	124	32	23%	0.26	19%	25	57	524
1993	162	136	35	22%	0.26	51%	12	47	570
1994	168	153	42	25%	0.27	40%	20	62	552
1995	175	156	53	30%	0.34	34%	34	87	627
1996	181	174	68	38%	0.39	43%	35	103	630
1997	192	176	50	26%	0.28	44%	31	81	638
1998	202	185	46	23%	0.25	42%	42	88	635
1999	220	199	57	26%	0.29	30%	35	91	264
Total	6467	5491	1173				503	1675	6756
Average	208.6	177.1	35.5	20%	0.23	34%	15.2	50.8	270.2

age of the bear. A permanent tag is also affixed to the hide. A person may not possess a green hide after the 48 hour check-in period, ship a green pelt to a taxidermist or out of the state of Utah if the green hide does not have a permanent possession tag attached. Evidence of sex must remain attached to the bear until after a permanent tag has been attached by the Division. Collected teeth have been are sectioned and age of the bear estimated by counting cementum annuli. The average age has ranged from 5.1 in 1996 to 5.6 in 1999. The ages of harvested bears have been used to estimate adult survival, which has ranged from 77.6% in 1997 to 82% in 1999 (Bates 2000).

Any hunter who wishes to bait must purchase a limited entry archery permit, is limited to archery tackle, and must obtain a Certificate of Registration for a bait permit. There are also some special regulations on how a bait station must be managed.

Hunters can increase their chances of harvesting a trophy bear by doing some scouting in their hunting area prior to the hunt. Food plots such as berry patches are the best places to look for bear sign. By evaluating the size of the tracks the hunter can get a good idea of the size of the bears that are in the area. Research has shown that there is an 86 percent chance that a black bear track with a front paw width larger or equal to 4.5 inches will be a male.

Large male bears are the most sought after by sport hunters, mainly because of their large hides and skulls. In most cases the size of the bear and condition of the bear's hide are the largest determining factors of whether the bear is harvested or not. The color of the bear can also have a lot to do in determining a bears trophy value, the more uncommon colors of cinnamon, brown and blonde being more highly sought after.

There are many other reasons that hunters pursue black bear other than for their trophy value. Many enjoy the challenge of training and running hounds. Others enjoy the process of selecting a bait site that will get the attention of the resident black bears. Many hunters like to bait because of the up close viewing possibilities that can occur. Baiting also allows the hunter to be very selective in harvesting a bear.

Early spring and late fall are when the bear hides are in the best condition. In Utah, bears are currently hunted only in the fall. This sometimes leads to problems with deer and elk hunters. Not only with big game hunters jumping treed bears and wandering through bait stations, but also with hounds running through big game herds and chasing them away from deer and elk hunters.

Guiding

Although Utah does not regulate guides, many hunters use guides to harvest black bears. The hunters using spot and stalk or baiting as their hunting methods are less likely to use a guide, while those hunters wishing to pursue bear with hounds are the most likely to use a guide. In 1998, 16 of 45 (35.5%) of the successful black bear hunters used a guide to harvest a bear.

In 1998, 53% of all bear hunters used hounds to hunt. In Utah, most guides use hounds to help hunters harvest black bear. However, the services of a guide can be a great help to a bear hunter no matter what method the hunter chooses to use. A fully guided hunter generally has a better chance of harvesting a bear. The guide generally has a good idea of where to find black bear. This relieves the hunter of the time consuming task of finding bear habitat, tending and maintaining bait stations (only archery hunters are allowed to use bait), and keeping track of bear behavioral patterns and movements. Because of the time, money and amount of space that it takes to keep hounds, it is impractical for all hunters to do so. This makes those that are able to keep hounds in high demand as guides.

Pursuit Hunting

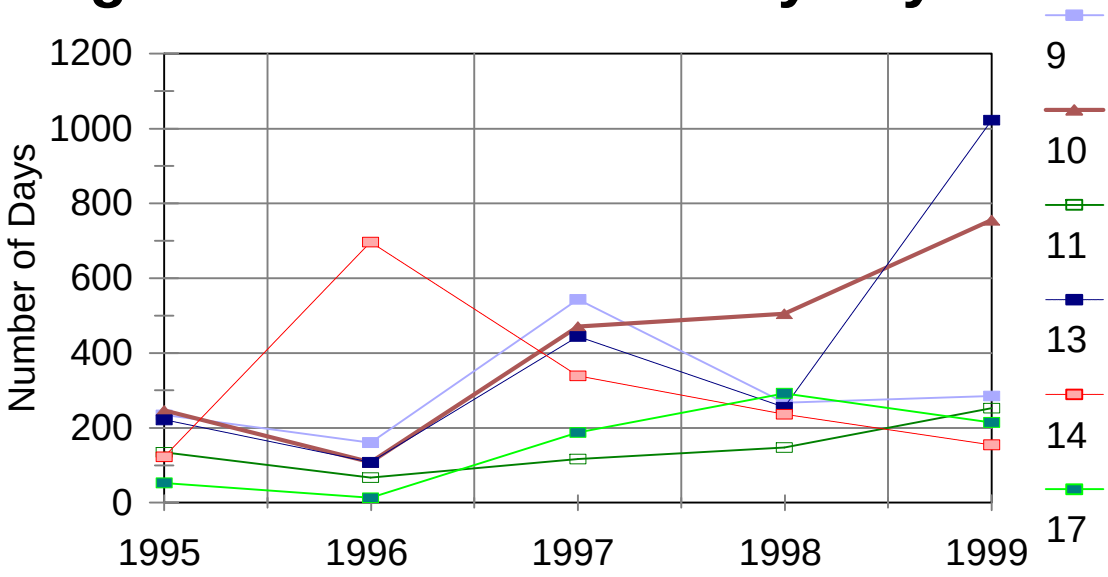
Since 1975, Utah has issued pursuit permits to hunters wishing to pursue bears with hounds, but who do not wish to take a bear. Until recently, the pursuit permit was valid for both cougar and bear. Beginning in 1999, the Utah Wildlife Board required separate pursuit permits for cougar and bear pursuit hunters. The cost of the permit was set at $25 for both resident and non-resident hunters. UDWR sends questionnaires annually to pursuit hunters in an effort to gather valuable population trend information.

Pursuit hunting allows the non-consumptive participation of over 200 sportsmen annually to train their hounds and to trail and tree bears with the only intent to either take photographs or to view the bear. This same group of hunters provide valuable information on the relative abundance of bears based on personal observation in different areas throughout the state. Some people believe that the pursuit of bears in certain areas may make bears less likely to come into conflict with humans by aversive conditioning of bears.

The number of pursuit permits sold in Utah steadily increased between 1975 to 1998, with a low of 48 sold in 1976, to a high of 638 in 1997 (Bates and Henry 1998). About 40% of those who purchased pursuit permits pursued bears. In 1999, 264 hunters purchased bear pursuit permits, with 212 estimated pursuit hunters afield (Bates 1999), compared to an estimated 198 bear pursuit hunters afield in 1995 (Evans and Blackwell 1995).

The amount of pursuit pressure has increased over the past 5 years. In 1995, pursuit hunters spent an estimated 2171 days afield, as compared to 2973 days afield in 1999 (Bates 1999). Increased pursuit pressure has mostly been restricted to 3 management units: Unit 14 - San Juan; Unit 13 -LaSals; and Unit 10 - Book Cliffs (Figure 4). This may in part be due to two factors: 1) the relatively low price for a non-resident pursuit permit of $25; and 2) the elimination of bear pursuit in Colorado. These three units are near the Colorado border, and many of the pursuit hunters encountered by UDWR personnel in these units in 1999 were from Colorado. Prior to 1998, Utah did not issue pursuit permits to non-residents. However, since Utah does not regulate guides nor have a guide license, the pursuit permit has been used as a means to allow a hunter

Figure 4. Bear Pursuit Days by Unit.



who has not drawn a limited entry permit an opportunity to pursue bear with hounds on an open unit. As such, it has been used as a defacto guide license. Since non-residents could not obtain a pursuit permit, the only they could guide in the state was to draw a limited entry permit. As a result of a lawsuit filed by non-resident guides, the Utah Attorney General's Office advised UDWR and the Wildlife Board that to prohibit non-residents from purchasing a pursuit permit or to charge them an excessive fee was interfering with inter-state free trade, which is protected by the U.S. Constitution. The Director has decided that pursuit permits will cost the same for residents and non-residents until the issue is settled.

Economics

The economic impact of black bear management can be broken down into three categories: 1) the money that is spent on bear related depredation and dealing with nuisance bears; 2) the money generated by license and permit sales to sportsmen; and 3) the money spent by those involved in black bear related recreation.

In spite of the fact that livestock numbers on public land in Utah are decreasing, the number of depredation incidents has increased from 44 in 1992 to 81 in 1999, with the highest number of incidents (85 total) in 1997 (Bates 2000). The total value of confirmed losses has risen from $19,173 in 1993 to $81,740 in 1999 with an average of $44,939 in reported losses each year. UDWR makes partial compensation to livestock operators for losses due to black bear depredation, which averaged $20,798 from 1992

to 1999 (Bates 1999, also see livestock depredation section).

A second way in which black bear management impacts the economy is through funds generated from license and permit sales to sportsmen. From 1996 to 1999, $63,944 have been generated in permit sales. Resident permit sales accounted for $37,379 and nonresident sales accounted for $26,565 (Table 4). Resident hunters were required to purchase a permit fee for $55, in addition to a $6 habitat authorization and a small game license for $13. Nonresidents paid $302 each, including the permit fee ($255), habitat authorization ($6) and nonresident small game license ($41). License dollars received by the Division are eligible to be matched with federal Pitman/Robertson Funds at a 3 to 1 match. This potentially could generate an additional $69,000 annually.

The third way Utah's economy is benefitted by black bear management is from related expenditures paid by those involved in black bear recreation. Those participating in hunting, pursuit, and non-consumptive enjoyment of bears purchase equipment, food, lodging and other items. The average hunter in Utah was estimated to spend $24 per day on these items (USFWS 1998), which generates an additional average annual amount of $106,458 into the Utah economy (Table 6).

Table 6. Permit revenue generated through black bear hunting in Utah, 1996-99.

	1996	1997	1998	1999
Resident Limited Entry Permit Sales	$8,480	$9,130	$9,487	$10,282
Non-resident Limited Entry Permit Sales	$7,084	$7,084	$5,819	$6,578
Non-resident Small Game License	$1,148	$1,148	$943	$1,066
Non-resident Habitat Authorization	$147	$147	$138	$156
Pursuit Permits	$4,075	$6,200	$6,200	$6,600
Livestock Damage Permits	$75	$0	$25	$50
Yearly Total	$21,009	$23,709	$22,612	$24,732
Pitman/Robertson Funds (3:1 match)	$63,027	$71,127	$67,836	$74,196
Grand Total	$84,036	$94,836	$90,448	$98,928

Some bear hunters use guides. Average costs for a guide were estimated at $1000 for a resident hunter, and $2500 for a non-resident hunter. This generates an additional average of $100,740 into the economy annually (Table 7).

Table 7. Estimated revenue generated by black bear hunting in Utah, 1996-99.

	1996	1997	1998	1999
Agency Revenue	$84,036	$94,836	$90,448	$98,928
Guide Fees	$100,200	$101,200	$94,380	$107,180
Hunting Related Expenditures	$88,608	$120,288	$97,200	$119,736
Yearly Estimates	$272,844	$316,324	$282,028	$325,844

ISSUES AND CONCERNS

Public Issues and Concerns

- Human safety.
- Effects on bear prey.
- Impact on livestock operations (prevention, compensation).
- Whether they should be hunted. (pro & con)
- Methods of hunting i.e. spot and stalk, baiting, hounding.
- Timing of hunting. (effects on bears, spring season, other game hunter conflicts)
- Concerns about individual bears as opposed to population management.
- Assuring continued viability of species in Utah.
- Lack of guide regulation.
- Not using meat for hunter consumption.
- Management of pursuit (numbers, timing, distribution, and permit prices)
- Nuisance bear management.
- All suitable habitat not occupied, and areas of low density of bears.
- Appropriateness of depredation control on public land.
- Lack of priority for bear management.
- Failure to get sex and age data on some of Wildlife Services take.
- Need to learn more about bears in Utah (ecology, biology, and behavior).
- Maintaining traditional hunting heritage and opportunity.
- Effects of livestock grazing on bear densities.

Wildlife Managers

- Lack of reliable population measurement method(s).
- Protection of adequate breeding female numbers.
- Adequate funding for research, management and damage compensation.
- Low agency priority on bear management.
- Effects of harvest strategies on population structure.
- Effects of hounding at various stages of bear life cycle.
- Bear hunter impacts on roads.
- Conflicts between bear hunters and big game hunters.
- Need to manage metapopulation.(connecting corridors)
- Size of management units. (topography and geography considerations)
- Need for public education.
- Difficulty in communicating rationale for Divisions actions to address problems.
- Loss of habitat.(need to manage)
- Lack of clearly defined goals.
- Need for monitoring habitat. (food production).
- Collaboration with public land management agencies needs improvement.
- Dealing with nuisance bears.
- Lack of enforcement on travel plans, campground rules, and grazing timing.

GOALS AND OBJECTIVES

Goal: Maintain a healthy bear population in existing occupied habitat and expand distribution while considering human safety, economic concerns, and other wildlife species.

Definition: A"healthy" bear population is one that has a proportion of breeding age animals that will maintain population levels consistent with habitat, and that maintains genetic variability.

Objectives:

A. Maintain current bear distribution, while working to increase bear distribution into suitable unoccupied or low density areas through the year 2010.

Performance Targets:

1. Number of wildlife management units that support huntable bear populations will exceed 19.
2. The number of wildlife management units that support bear populations will exceed 22.

Strategies:

1. Develop model estimating black bear numbers and potential by unit.
2. Assess feasibility of reintroducing black bears into areas of suitable habitat statewide not currently occupied.
3. Review current reintroduction efforts and develop methods and policy to establish bears in unoccupied habitat.
4. Maintain migration corridors to allow natural expansion into unoccupied habitat.

A. Maintain current bear populations, with a reasonable proportion of older age animals and breeding females, balancing population numbers with other wildlife species through the year 2010.

Performance Targets:

1. The percent of females in the harvest will be less than 40%.
2. The average age of harvested bears will exceed 5 years.
3. Total adult survival will exceed 0.78.
4. Where feasible, utilize non-lethal methods to reduce conflicts between humans and bears, allowing higher bear population densities

Strategies:

1. Conduct research and implement techniques to determine population levels, such as tracking studies, or dna marker population assessment.
2. Consider experimental harvest strategies to determine affects on harvest statistics and performance targets, such as: spring hunt to reduce proportion of females in the harvest; spring-hounding, fall-baiting seasons; unlimited permits on season concurrent with big game seasons; spot and stalk only hunts.
3. Make every reasonable effort to collect a tooth and record sex of every known bear mortality, including sport harvest, Wildlife Services take.
4. Develop unit management plans that balance black bear numbers with available habitat.
5. Monitor bear health and disease and take actions to maintain healthy individuals.
6. If bear predation is documented to be a problem, implement Predator Management Plans in accordance with the Division's policy on *Managing Predatory Wildlife Species*.
7. Secure funding to accomplish essential elements of Black Bear Management Plan.
8. Educate the public on black bear biology and management to foster public support.
9. Coordinate and cooperate with adjoining states and researchers.
10. Manage pursuit to eliminate detrimental effects on bears, eg. number of hounds per pack, number of pursuit permits, hunt unit pressure and other controls.

J. Minimize the loss in quality and quantity of critical and high priority bear habitat, including migration corridors between occupied areas through 2010.

Performance Targets:

1. Number of acres of critical and high priority bear habitat.
2. Number of habitat improvement projects completed, with a goal of one per region per year.
3. Suitable migration corridors between areas of occupied habitat **..**
4. Maintain average bear food value for each unit.

Strategies:

1. Protect critical and high priority bear habitat through consulting with and commenting on other land management agencies development proposals.
2. Undertake a minimum of 5 habitat improvement projects per year to enhance critical and high value bear habitat, focusing on aspen regeneration, natural fire management, increasing density of food

producing plants, and riparian areas.

3. Using GIS, develop map depicting black bear habitat and identify important migration corridors. Work with other agencies to protect those corridors.
4. Conduct research to determine what constitutes, and how to restore, critical and high value bear habitat.
5. Annually monitor bear food plants to determine production.

K. Reduce the risk of loss of human life and reduce chances of injury to humans by bears through the year 2010.

Performance Targets:

1. Number of people injured by bears.
2. Number of incidents reported.

Strategies:

1. Implement guidelines identified in the Division's *Managing Nuisance Bears* policy (WRWLD-3).
2. Work with federal land management agencies and private landowners to enforce regulations and eliminate attractants that may bring bears and humans into close contact, such as using 'bear-proof' garbage cans in campgrounds, etc.
3. Educate landowners about the dangers associated with living in bear habitat and how to reduce the likelihood of encounters.
4. Educate the public about the dangers associated with recreating in bear habitat and how to avoid problems.

L. Reduce the number of livestock killed by bears.

Performance Target:

1. Number of lambs, ewes, bucks, calves and other livestock killed by bears.

Strategies:

1. Remove depredating bears by targeting offending individuals in accordance with MOU with Wildlife Services signed in 1993.
2. Implement non-lethal methods to reduce conflicts between bears and livestock.
3. Fund research to determine factors that will minimize livestock predation.
4. Work with land management agencies and livestock operators to utilize grazing techniques that will minimize depredation.
5. Implement an experimental spring bear hunt in historic problem areas to

determine if it will help reduce livestock depredation while at the same time reducing female bear take.

M. Maintain quality recreational opportunities, both consumptive and non-consumptive, through the year 2010.

Performance Targets:

1. Number of bear hunters.
2. Number of bear pursuit hunters.
3. Number of bait COR's.
4. Number of days people spend looking or observing bears or sign.
5. Number of reported conflicts between different user groups.

Strategies:

1. Maintain recreational hunting, including hounding, baiting, and pursuit as management tools.
2. Increase watchable wildlife opportunities for black bears, through using the public to conduct bear food surveys, track counts, and other needed efforts.
3. Implement harvest strategies that will tend to reduce conflicts between resource users, such as spot and stalk hunting during big game seasons, or limiting the number of hounds, and other approaches.
4. Work with the public to draft legislation to affect guide regulation.

LITERATURE CITED

AGFD (Arizona Game and Fish Department). 1998. AGFD operating manual: wildlife, habitat and the environment: nuisance bear. Operating Manual section 11.13. Apr 1, 1998.

Allen, R.B. 1984. Experimental pursuit of black bears with trained bear dogs. Maine Dept. Inland Fisheries and Wildlife, Augusta ME. Proceedings of the Eastern Workshop on Bear Management.

Ambrose, S.E. 1996. Undaunted Courage: The Story of Meriweather Lewis and William Clark.

Amstrup, S.C. and J. Beecham.1976. Activity patterns of radio-collared black bears in Idaho. J. Wildl. Manage. 40:340-348.

Armistead, A.R., Mitchell, K. and G.E. Connolly. 1994. Bear relocations to avoid bear/sheep conflict. Proc. 16th Vertebr. Pest Conf., pp. 31-35.

Auger, J. 1994. Viability and germination of seeds from seven fleshy-fruited shrubs after passage through the American Black Bear (Ursus Americanus). M.S. thesis. Brigham Young University. pp.48

Auger, J., and H. Black. 1995. Proceedings of the Fifth Western Black Bear Workshop Department of Zoology, Brigham Young University, Provo Utah, 149 pp.

Augustive, D.J and S.L. McNaughton. 1998. Ungulate effects on the functional species composition of plant communities: Herbivore selectivity and plant tolerance. J. Wildl. Manage. 62:1165-1183.

Barnes, V.G. and O.E. Bray. 1967. Population characteristics and activities of black bears In Yellowstone National Park. Final Report. Colo. Coop. Wildl.Res. Unit, Colorado State Univ.

Bashin, B.J. 1989. Please don't eat the trees. Sierra. July/Aug 1989.

Bates, J.W. and A. Henry. 1998. Utah Black bear harvest. Utah Div. of Wildl. Res. Publ. No. 99-25. 21 pp.

Bates, J.W. 2000. Utah black bear harvest report. Utah Div. of Wildl. Res. Publ. No. 00-07. 22 pp.

Bates, S.B. 1991. Home range, habitat selection and food habits of central Utah black bears. M.S. Thesis, Brigham Young Univ., Provo, UT. 91 pp.

Beck, T.D.I. 1991. Black bears of west-central Colorado. Colo. Div. of Wildlife Tech. Pub. No. 39. DOW-R-T-39-91. Denver, CO. 86 pp.

Beck, T.D. I., D. S. Moody, D. B. Koch, J. J. Beecham, G. R. Olson and T. Burton. 1995. Sociological and ethical considerations of black bear hunting. Proceedings of the fifth

western black bear workshop. Provo, Utah.

Beecham, J. 1980. Population characteristics, denning and growth patterns of black bears in west-central Idaho. Ph.D. Diss. Univ. of Montana, Missoula. 101 p.

Beecham, J.J. and J. Rohlman. 1994. A Shadow in the Forest, Idaho's black bear. Idaho Department of Fish and Game. The University of Idaho Press , Moscow Idaho , 245 pp.

Black Bear Management Plan, 1999-2010. 1998. Idaho Department of Fish and Game, Boise, ID.

Black, H.L. and J.S. Green. 1985. Navajo use of mixed-breed dogs for management of predators. J. Range Manage. 38(1): 11-15.

Brady, J.R. and D.S. Maehr. 1982. A new method for dealing with apiary-raiding black bears. Proc. 36th Annu. Conf. Southeast. Assoc. Fiah and Wildl. Agencies, pp.571-577.

Briscoe, R. G. 1991. Research Survey on Wildlife Preserves and Bear and Cougar Hunting. Insight Research.

Bunnell, F.L. and D.E.N. Tait 1981. Population dynamics of bears-implications. Pages 75-98 in C.W. Fowler and T.D. Smith (ed.s). Dynamics of large mammal populations. John Wiley and Sons, NY. 477 pp.

Bunnell, S. 1999. Spring/summer food habits of black bears in Utah: Four months before the mast. M.S. Thesis, Brigham Young Univ. 34 pp.

CDOW (Colorado Division of Wildlife). 1998. April 17 wildlife report. Denver, CO.

CDOW (Colorado Division of Wildlife). 1999a. Administrative Directive W-2 (Draft). Denver, CO.

CDOW (Colorado Division of Wildlife). 1999b. May 18 wildlife report. Denver, CO.

Colvin, T.R. 1976. Aversive conditioning black bear to honey utilizing Lithium Chloride. Game and Fish Division, Georgia Dept. Nat. Res. Fitzgerald, GA.

Danvir, R.E., F.G. Lindzey and G. Chapman, 1983. The black bear in Utah-1983: a survey. Utah Coop. Wildl. Res. Unit, Utah State Univ., Logan, UT, 55p.

Dorrance, M.J. and L.D. Roy. 1975. Aversive conditioning of black bears in beeyards failed. Proc. Verterbr. Pest Conf. 8:251-254**.**

Elmore, F.H. 1976. Shrubs and trees of the southwest uplands. Southwest Parks and Monuments Assoc. Popular series No. 19. 214 p.

Fair, J.S. 1977. Report from Utah. pages 104-110 in D. Burk (ed.). The black bear in modern North America. Proceedings of the workshop on the management

Biology of North American black bear. Boone and Crockett Club. 300p.

Flowers, R.H. 1986. Supplemental feeding of black bear in tree-damaged areas of western Washington. Abstract. Animal Damage Control Service, Washington Forest Protection Association, Aberdeen, WA

Franzmann, A.W., C.C. Schwartz, and R.O. Peterson. 1980. Moose calf mortality in the summer on the Kenia Peninsula, Alaska. J. Wildl. Manage. 44:764-768.

Garshelis, D. L. 1990. Monitoring effects of harvest on black bear populations in North America: a review and evaluation of techniques. Proc. 19th Eastern Black Bear workshop. pp. 120-144.

Garshelis, D. L. 1991. Monitoring black bear populations: pitfalls and recommendations. Proc. 4th Western Black Bear workshop. 123-144.

Garshelis, L. and L. G. Visser. 1997. Enumerating mega-populations of wild bears with an ingested biomarker. J. Wildl. Manage. 61: 466-480.

Gilbert, B.K. and L.D. Roy. 1975. Prevention of black bear damage to beehives using aversive conditioning. Dept. Agriculture, Edmonton, Alberta.

Graber, D.M. and M. White. 1983. Parks and bears: the ecological consequences of recreation. Sixth intl. conf. on bear res. and manage. Bear Biology Assoc. Grand Canyon, AZ. P.24.

Green, R.J. 1982. An application of behavioral technology to the problem of nuisance bears. The Psychological Record 43:501-511.

Gunther, K. and H. Hoekstra. 1996. Bear-inflicted human injuries in Yellowstone, 1970-1994. Yellowstone Science.

Gustavson, C.R. 1974. Taste aversion conditioning as a predator control method. PhD Dissertation, Dept. Psych., Univ. Of Utah, 1974.

Gustavson, C.R., Kelly, D.J., Sweeney, M. and S. Thomas. 1976. Final report to the Washington Gme Department, 1976. Unpubl. Report.

Hastings, B.C., B.K.Gilbert and D.L. Turner. 1981. Black bear behavior and human-bear relationships in Yosemite National Park. Final Report to the National Park Service, Western Region.

Hastings, B.C., Gilbert, B.K. and D.C. Turner. 1981. Black bear behavior and human-bear relationships at campsites in Yosemite National Park. Final report to the NPS, Rocky Mountain Reg. Tech. Rep. No. 2, Cooperative NPS Res. Studies Unit. 42 pp.

Heady, H.F. 1975. Rangeland Management. McGraw-Hill Inc., USA. 460 p.

Herrero, S. 1972. Aspects of evolution and adaptation in American black bears (Ursus americanus) and brown and grizzly bears (U. arctos) of North America. In Bears, IUCN, pp. 121-146.

Herrero, S. 1980. Black bear behavior at a dump in Jasper National Park. Fifth int. conf. on bear res. and manage. Bear Biology Assoc. Madison, WI.

Herrero, S. 1985. Bear Attacks, Their Causes and Avoidance. Lyons & Burford, Publishers, 287 pp.

Herrero, S. 1985. Bear attacks. Lyons and Buford, publ. 287 pp.

Higgins, K.L. and M.R. Vaughn 1999. Documenting the hunting of bears with hounds in Virginia. Department of Fisheries and Wildlife Sciences, Virginia Polytechnic and State University, Blacksburg, VA.

Hugie, R.D. 1983. Black bear ecology and management in the northern conifer-deciduous forests of Maine. Sixth intl. conf. on bear res. and manage. Bear Biology Assoc. Grand Canyon, AZ. p 29.

Hunt, C.L. 1984. Behavioral responses of bears to tests of repellents, deterrents and aversive conditioning. M.S. Thesis, U. of Montana, Missoula.

Hunt, C.L. 1999. The partners in life program and the Wind River Karelian bear dogs: bear shepherding to reduce human-bear conflict. Internal Publication, the Wind River Bear Institute. Heber City, UT.

Hygenstrom, S.E. 1994. Black bears: damage prevention and control methods. Publication of the Cooperative Extension Division, Institute of Agriculture and Natural Resources, U. Nebraska, Lincoln.

IDFG)Idaho Department of Fish and Game). 1998. Black bear management plan: 1999-2000. IDFG, Boise ID. December, 1998.

Irwin, L.L. and F.M.Hammond. 1985. Managing black bear habitats for food items in Wyoming. Wildl. Soc. Bull. 13:477-483.

Johnson, C.M. 1970.Common native trees of Utah. Agric. Exp. Stn. Coop. Ext. Serv. Utah State Univ. Spec. Rept. No. 22. 109p.

Jorgenson, C. 1980. Bear-livestock interactions, Targhee National Forest. Fifth intl. conf. on bear res. and manage. Bear Biology Assoc. Madison, WI.

Jonkel, C.J. and I. McT. Cowan. 1971. The black bear in the spruce-fir forest. Wildl. Monogr. 27:1-57.

Kay, C. E. 1995. Browsing by native ungulates: effects on shrub and seed production in the greater Yellowstone ecosystem. In: Roundy, B.A., E.D. McAuthur, J.S. Haley and

D.K. Mann, comps. Proceedings: Wildland shrub and arid land restoration symposium, Las Vegas, NV. Gen. Tech. Rep. INT-Service, Intermountain Res. Stn. pp. 310-320.

Kellyhouse, D.G. 1977. Habitat utilization by black bears in northern California. Pages Bears-their biology and management. Bear Biology Assoc. series No. 4. 375 pp.

Kolenosky, G.B., and S.M. Strathearn. 1987. Black Bear, In, *Wild Furbearer Management and Conservation in North America.* M. Novak, J.A. Baker, M.E. Obhart and B. Malloch, eds. Ontario Ministry of Nat. Res. 1150 pp.

Krannich, R. L. and T. L. Teel. 1999. Attitudes and Opinions About Wildlife Resource Conditions and Management in Utah. Utah State Univ., Logan, Ut., 59 pp.

Krannich, R.S. 1999. Highlights from a public opinion survey: Attitudes and opinions about wildlife resource conditions and management in Utah - results of a 1998 statewide general public and lisence purchaser survey. Utah state University. Commissioned by Utah Dept of Nat. Res., Div Wildl. Res. Logan, UT.

Laycock, ,G. 1987. Making bad bears into good bears could spare bears. Audubon 89:22-28.

LeCount, A.L. 1983. Denning ecology of black bears in central Arizona. Sixth intl. conf. bear res. and manage. Bear Biology Assoc. p. 71-78.

LeCount, A.L., R. H. Smith and J. R. Wegge. 1984. Black bear habitat requirements in central Arizona. Ariz. Game and Fish Special Rep. No. 14. 40 p.

LeCount, A.L. 1986. Black bear field guide. Special Report No. 16. Arizona Game and Fish Dept. Phoenix. 131 pp.

Lindzey, F.G. and E.C. Meslow. 1977. Home range and habitat use by black bears in southwestern Washington. J. Wildl. Manage. 41:413-425.

Lindzey, F.G. 1981. Denning dates and hunting seasons for black bears. Wildlife Soc. Bull. 9:212-216.

Lindzey, F.G., K.R. Barber, R.D. Peters and E.C. Meslow. 1983. Responses of a black bear population to a changing environment. Sixth intl. conf. on bear res. and manage. Grand Canyon, AZ.

Litcaitis, J.A. and D.M. Kane 1994. Relationship of hunting technique and hinter selectivity to composition of black bear harvest. Wildlife Soc. Bull. 22:604-606.

Meadows, L.E., Andelt, W.F. and T.I. Beck. 1998. Managing bear damage to beehives. Colorado State University Cooperative Extension Report No. 6.519.

McCullough, D.R. 1982. Behavior, bears and humans. Wildl. Soc. Bull. 10:27-33.

Miller, S.D. 1990. Impact of increased bear hunting on survivorship of young bears. Wildlife Soc. Bull. 18:462-467.

Nickell, R. 1998. How not to ruin a bruin. H.H. News. June 11. (Montana newspaper)

Novick, H.J., J.M. Siperek, and G.R. Stewart. 1981. Denning characteristics of black bears, Ursus americanus, in the San Bernadino mountains of southern California. Calif. Fish and Game. 68-21-35.

NPS (National Park Service). 1998. Barking dogs repel hungry park bears. National Parks 72(No 11-12): 13-14.

Noyce, V. and D. L. Garshelis. 1997. Influence of natural food abundance on black bear harvest in Minnesota. J. Wildl. Manage. 61(4): 1067-1074.

Ogborn, G.L. 1990. Ants (*Formicidae*) in the diet of American black bears in south-eastern Utah. M.S. Thesis, Brigham Young Univ., Provo, Ut. 17 pp.

OSUES (Oregon State University Extension Service). 1985. Introducing livestock-guarding dogs. Extension Circular 1224, June 1985.

Pacquet, D.C.and L.N. Carbyn. 1986. Wolves (Canis lupus) killing denning black bears (Ursus americanus) in the Riding Mountain National Park area. Can. Field-Nat. 100:371-372.

Pederson, J.C., and K.P. McDonald. 1990. Utah Black Bear Harvest. Utah Division of Wildlife Resources. Publ. Number 91-3, pp.17

Pelchat, B.O. and R.L. Ruff. 1983. Habitat and spatial relationships of black bears in boreal mixed forests of Alberta. Sixth intl. conf. on bear res. and manage. Grand Canyon, AZ.

Pelton, M.R. 1982. Black bear. Pp. 389-408 in Demaris, S. and P.R. Krausman eds. Ecology and management of large mammals in North America. Prentice-Hall Inc. Upper Saddle River, N.J.

Pelton, M.R. 2000. Black bear. In Ecology and management of large mammals in North America. eds. S. Demarais and P.R. Krausman. pp. 389-408.

Poelker, R.J. and H.D. Hartwell 1973. The black bear of Washington. Washington State Game Department. Biol. Bull. 14:1-180.

Rawley, E.V. 1985. Early records of wildlife in Utah. Utah Div. Wildl. Res. Publ. No. 86-2. Salt lake City, UT. 102 pp.

Reynolds, D.G. and J. Beecham. 1977. Home range activities and reproduction of black bears in west-central Idaho. Pages 181-190 in Martinka, C. J. and K.L. McArthur eds. Bears-their biology and management. Bear Biology Assoc. No. 4. 375 p.

Richardson, W.S. 1991. Habitat selection and feeding ecology of black bears in south-eastern

Utah. M.S. Thesis, Brigham Young Univ., Provo, Ut. 75 pp.

Rogers, L.L. 1976. Effects of mast and berry crop failures on survival, growth and reproductive success of black bears. Trans. N. Am. Wildl. Nat. Res. conf. 41:431-438.

Rogers, L.L. 1986. Effects of translocation distance on frequency of return by adult black bears. Wldl. Soc. Bull. 14:76-80.

Rogers, L. 1987. Effects of food supply and kinship on social behavior, movements, and population growth of black bears in northeastern Minnesota. Wildl. Monogr. 97. 72 pp.

Rogers, L. 1999. How to live with bears. www.ncfes.unm.edu/epubs/ht66/html.

Ross, P.I., G.E. Hornbeck and B.L. Horejsi. 1988. Late denning black bears killed by grizzly bear. J. Mamm. 69:818-820.

Savory, A. 1988. Holistic resource management. Island Press. Washington, D.C. 564 p.

Schlegel, M. 1976. Factors affecting calf elk survival in north central Idaho. Proc. West. Assoc. Fish and Game Comm. Ann. Mtg. 56:342-355.

Schopmeyer, C.S. 1974. Seeds of the woody plants of the United States. U.S.D.A. Forest Service Agric. Handbook No. 450. 883 p.

Shull, S.D. 1990. Management of nuisance black bears in the interior highlands of Arkansas. M.S. Thesis, University of Arkansas.

Sibbison, J. 1984. So sheep may safely graze. Defenders July/Aug 1984.

Smith, R.B. 1983. Mule deer reproduction and survival in the LaSal Mountains, Utah. M.S. Thesis, Utah State Univ., Logan. 102 pp.

Smith, R.H. and A.L. LeCount. 1983. Estimating the habitat preferences of black bears in central Arizona. Sixth intl. Conf. On bear res. and manage. Grand Canyon, AZ.

Sorenson, D. 1995. Spiked honey makes bear alter his dining habits. The Tucson Citizen. July 19, 1995.

Tamlos, M. and M. Bodenchuk. 1999. Wildlife Services bear damage assessment. Unpubl. Rep. USDA - Wildl. Serv. Salt Lake City, UT

Tisch, E.L. 1961. Seasonal food habits of the black bear in the Whitefish range of northeastern Montana. M.S. Thesis. Montana State Univ., Missoula. 108 p.

Tolman, J. 1998. A reproductive habitat comparison of two Utah black bear populations. M.S. thesis. Brigham Young University. pp.93

Twyman, G. 1999. Utahn, dogs have problem bears on the run. Deseret News. July 6th, pg A1.

UDWR (Utah Division of Wildlife Resources). 1989. Methods and procedures for handling and moving predators. Nongame Section Rep. Salt Lake City, UT. 78 pp.

UDWR (Utah Division of Wildlife Resources). 1999a. Utah cougar management plan. Publ. No. 99-01. Salt Lake City, UT. 53 pp.

UDWR (Utah Division of Wildlife Resources). 1999b. Utah black bear harvest report 1998. Publ. No. 99-25. Salt Lake City, UT. 21 pp.

UDWR (Utah Division of Wildlife Resources). 1999c. Administrative directive on black bear depredation. Directive No. W5WLD-3. Salt Lake City, UT. 21 pp.

USDA (United States Department of Agriculture). 1995. Wildlife Damage Control work in Utah. Environmental Impact Statement. USDA-APHIS, Wash. D.C.

U.S.F.W.S. 1998. National fishing and hunting, and wildlife-associated recreation, Utah. FHW96-UT. Wash. D.C. 47 pp.

Unsworth, J.W., J.J. Beecham and L.R. Irby. 1989. Female black bear habitat use in west-central Idaho. J. Wildl. Manage. 53:668-673.

Urness, P.J. 1990. Livestock as manipulators of mule deer winter habitat in northern Utah. In: Severson, K.E. ed. Can livestock be used as a tool to enhance wildlife habitat? Gen. Tech. Rep. RM-194. Fort Collins, CO. U.S.D.A. Forest Service, Rocky Mountain Forest and Range Exp. Stn. 123 p.

Warburton, G. S. 1992. Population trend indicator development. North Carolina Wildlife Resources Commission. Interim Progress Report. 21 pp.

Wasserman, J. 1996. Bear Rehab. PAWS news. Winter 1996, pg. 7.

WGFD (Wyoming Game and Fish Department). 1994. Black bear management plan. (Edited by Moody et al.). WGFD, Cheyenne, WY.

WGFD (Wyoming Game and Fish Department). 1998. Protocol for managing aggressive wildlife/human interactions. (Edited by Moody et al.). WGFD, Cheyenne, WY. June 1998

Willey, C.H. 1971. Vulnerability in Vermont's black bear population. Vermont Fish and Game Department. Federal Aid in Wildlife Restoration. Job Project Report, Project W-38-R. 40 pp.

Willard, E.E. and C.M. McKell. 1978. Response of shrubs to simulated browsing. J. Wildl. Manage. 42:514-519.

Wooding, J.B., Hunter, N.L. and T.S. Hardisky. 1988. Trap and release apiary-raiding black bears. Proc. Annu. Conf. Southeast. Assoc. Fish and Wildl. Agencies 42:333-336.

Wray, P. 1987. Black bears and timber trees. American Forests. Sept/Oct 1987.

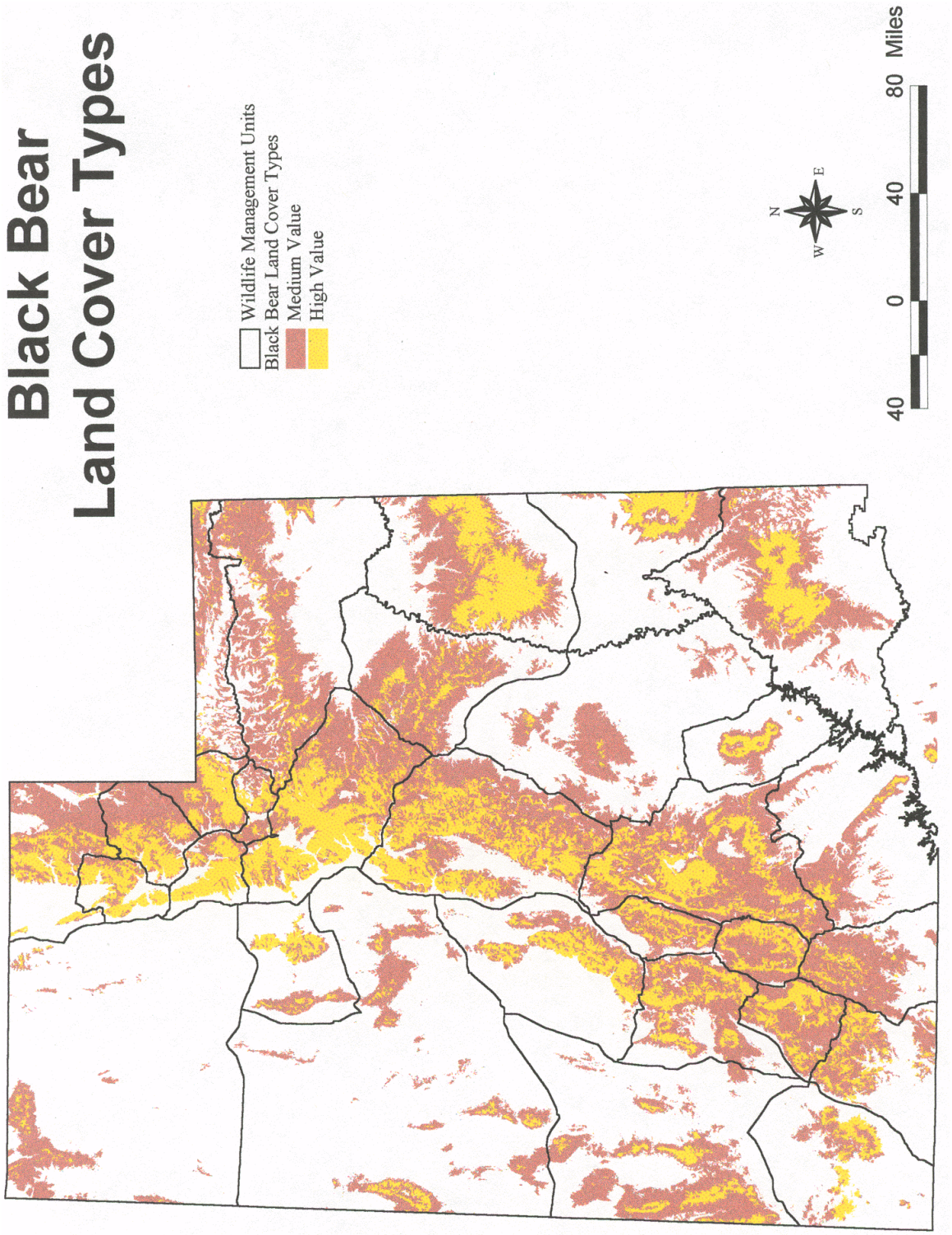
Young, A.T. 1995. Black bear behavior and population structure as revealed by road track surveys. M.S. Thesis. Brigham Young University, Provo, UT. 35 p.

Young, D.D. and J. Beecham. 1983. Black bear habitat use at Priest Lake Idaho. Sixth intl. conf. on bear res. and manage. Bear Biology Assoc. P. 56.

Youngblood, A.P. and W.F. Mueggler. 1981. Aspen community types on the Bridger-Teton Natinal Forest in western Wyoming. U.S. Dep. Agric., For. Serv. Res. Pap. INT-272, Ogden, UT. 34p.

Ziegltrum, G.J. and D.L. Nolte. 1997. Black bear damage management in Washington State. Pro. Wildl.. Damage Mgt. For Nat. Res. Managers, pp.116-119.

Appendix I. Black Bear Habitat in Utah.



Appendix II. Utah Black Bear Population Model.

Utah Black Bear Management Model

Unit	Unit Name	Med Value Habitat	Med Value sq mi	High Value Habitat	High Value sq mi	Total Habitat	Total sq mi	Med Value Density	High Value Density	Total Density	Pop Est H-M Den	Pop Est Tot Den	BDG Estimate	10 year Total Harvest	Harvest/ Sq.Mi.	Density Estimate	Population Estimate
1	Box Elder	152623	589.0	12524	48.3	165147	637.4	0.1	0.3	0.1	73	64	0	0	0	0.0001	0
15	Henry Mtns	45237	174.6	29050	112.1	74287	286.7	0.1	0.3	0.1	51	29	0	0	0.0000	0.0001	0
30	Pine Valley	68744	265.3	52521	202.7	121265	468.0	0.1	0.3	0.1	87	47	10	0	0.0000	0.01	5
24	Mt Dutton	96604	372.8	63790	246.2	160394	619.0	0.1	0.3	0.1	111	62	20	0	0.0000	0.01	6
5	East Cyn	6321	24.4	74495	287.5	80816	311.9	0.1	0.3	0.1	89	31	15	0	0.0000	0.01	3
20	SW Desert	325142	1254.8	76463	295.1	401605	1549.9	0.1	0.3	0.0001	214	0	0	0	0.0000	0.0001	0
27	Paunsaugunt	192505	742.9	318863	1230.6	511368	1973.6	0.1	0.3	0.1	443	197	25	0	0.0000	0.01	20
21	Fillmore	95682	369.3	102943	397.3	198625	766.6	0.1	0.3	0.1	156	77	35	0	0.0000	0.01	8
26	Kaiparowitz	16731	64.6	19043	73.5	35774	138.1	0.1	0.3	0.0001	29	0	0	0	0.0000	0.0001	0
12	San Rafael	222340	858.1	6965	26.9	229305	885.0	0.1	0.3	0.0001	94	0	0	0	0.0000	0.0001	0
18	Oquirrh Mtns	50305	194.1	45694	176.4	95999	370.5	0.1	0.3	0.1	72	37	0	0	0.0000	0.01	4
19	West Desert	245895	949.0	40699	157.1	286594	1106.1	0.1	0.3	0.0001	142	0	0	0	0.0000	0.0001	0
22	Beaver	188430	727.2	97724	377.2	286154	1104.4	0.1	0.3	0.1	186	110	20	1	0.0009	0.05	55
2	Cache	179795	693.9	93203	359.7	272998	1053.6	0.1	0.3	0.1	177	105	50	1	0.0009	0.05	53
23	Monroe	74218	286.4	62103	239.7	136321	526.1	0.1	0.3	0.1	101	53	25	1	0.0019	0.05	26
4	Morgan/Rich	31749	122.5	76485	295.2	108234	417.7	0.1	0.3	0.1	101	42	42	1	0.0024	0.05	21
3	Ogden	25534	98.5	63927	246.7	89461	345.3	0.1	0.3	0.1	84	35	35	1	0.0029	0.05	17
28	Panguitch	130962	505.4	77362	298.6	208324	804.0	0.1	0.3	0.1	140	80	40	9	0.0112	0.1	80
6	Chalk Creek	68041	262.6	71043	274.2	139084	536.8	0.1	0.3	0.1	109	54	54	7	0.0130	0.1	54
8	North Slope	125771	485.4	15253	58.9	141024	544.3	0.1	0.3	0.1	66	54	25	10	0.0184	0.1	54
25	Plateau	456788	1762.9	246441	951.1	703229	2714.0	0.1	0.3	0.1	462	271	271	58	0.0214	0.15	407
29	Zion	48576	187.5	68744	265.3	117320	452.8	0.1	0.3	0.1	98	45	45	10	0.0221	0.15	68
7	Kamas	38597	149.0	25405	98.0	64002	247.0	0.1	0.3	0.1	44	25	50	8	0.0324	0.15	37
14	San Juan	343991	1327.6	137558	530.9	481549	1858.5	0.1	0.3	0.2	292	372	300	72	0.0387	0.2	372
9	South Slope	451726	1743.4	59596	230.0	511322	1973.4	0.1	0.3	0.2	243	395	200	78	0.0395	0.2	395
17	Wasatch Mtns	275027	1061.4	315918	1219.2	590945	2280.7	0.1	0.3	0.2	472	456	300	92	0.0403	0.2	456
16	Manti	394756	1523.5	326027	1258.3	720783	2781.8	0.1	0.3	0.2	530	556	556	122	0.0439	0.2	556
10	Book Cliffs	256903	991.5	242511	935.9	499414	1927.4	0.1	0.3	0.2	380	385	385	89	0.0462	0.2	385
11	Nine Mile	294415	1136.3	64115	247.4	358530	1383.7	0.1	0.3	0.2	188	277	277	103	0.0744	0.2	277
13	LaSal Mtns	80746	311.6	75051	289.6	155797	601.3	0.1	0.3	0.2	118	120	150	87	0.1447	0.3	180
	Total	4984154	19235.7	2961516	11429.6	7945670	30665.3				5352	3980	2930				3540